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United States
Department of
Agriculture

Forest
Service

**Engineering
Staff**

Washington, D.C.

EM-7720-102

Standard Specifications for Construction of Trails

June 1984

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SECTION 900 GENERAL SPECIFICATIONS

Section 901 - Abbreviations

Whenever the following terms, or pronouns in place of them, are used in these specifications, the intent and meaning shall be interpreted as indicated. Reference to a specific standard or specification shall mean the latest edition or amendment in effect on the date of the invitation to bid.

901.01
Word Abbreviations

AASHTO--American Association of State Highway and Transportation Officials
APA--American Plywood Association
ASTM--American Society for Testing and Material
AWPA--American Wood Preservers Association
FED. SPEC. or FS--Federal Specifications
NBS--National Bureau of Standards
OSHA--Occupational Safety and Health Act
PS--Product Standard issued by the U.S. Department of Commerce
WCLIB--West Coast Lumber Inspection Bureau
WWPA--Western Wood Products Association

901.02
Pay Item
Abbreviations

Al.--Aluminum
Al.2--Aluminized Type 2
&--And
Xing--Crossing
B.C.C.--Bituminous
C.Y.--Cubic Yard
C.S.P.--Corrugated Steel Pipe
C.Al.P.--Corrugated Aluminum Pipe
Dia.--Diameter
EA--Each
' --Feet
" --Inches
L.F.--Linear Foot
L.S.--Lump Sum
Max.--Maximum
MI--Miles
P.E.--Polyethylene
PVC--Polyvinylchloride
S.F.--Square Foot
S.Y.--Square Yard
STA--Station
Str.--Structure

Section 902 - Definitions

Whenever the following terms, or pronouns in place of them, are used in these specifications or in other contract documents, the intent and meaning shall be interpreted as follows:

Berm. The ridge of material formed on the outer edge of the trail that projects higher than the center of the trail tread.

Borrow. Soil, gravel, or rock materials taken from sources approved by the Engineer, to be used for embankments and backfilling.

Compacted. Consolidation that is obtained by tamping or rolling mineral soil and small aggregate in successive layers not more than 6 inches in loose depth. Compacting shall continue until no noticeable displacement of material is observed.

Contracting Officer. The person executing this contract on behalf of the Government, including a duly appointed successor.

Designated on the Ground. Point out or mark the location of materials, work areas, and construction items, including lines and grades, with stakes, flagging, tags, or paint.

Drawings. The documents showing details for construction of a facility, including straight line diagrams, trail logs, standard drawings, construction logs, plan and profile sheets, cross sections, diagrams, layouts, schematics, descriptive literature, and similar materials.

Duff. Organic material overlying rock or mineral soil.

Engineer. The Contracting Officer's Representative (COR) responsible for onsite administration of the contract within the limits of specific delegation.

Full Bench. Where the entire trailbed is constructed on undisturbed material.

Inslope. Where the trailbed is sloped downward toward the backslope of the trailway.

Mineral Soil. Organic free soil that contains rock less than 2 inches in maximum dimension.

Outslope. Where the trailbed is sloped downward toward the embankment or daylight side of the trailway.

Sideslope. The natural slope of the ground measured at right angle to the trail centerline; usually expressed in percent.

Turnpike. Tread made stable in wet, boggy areas by placing mineral soil between parallel side logs or rocks. May include ditches alongside the trail.

Water Course. Any channel, either natural or constructed, where water flows or will collect and flow.

USDA - Forest Service

List of Standard Drawings & Specifications for Trail Construction

List of Standard Drawings & Specifications for Trail Construction

Trail Number	Standard Drawings		Standard Specifications		Special Project Specifications	
	Form Number	Date	Number	Date	Number	Date

FS-7700-60 (6/84)

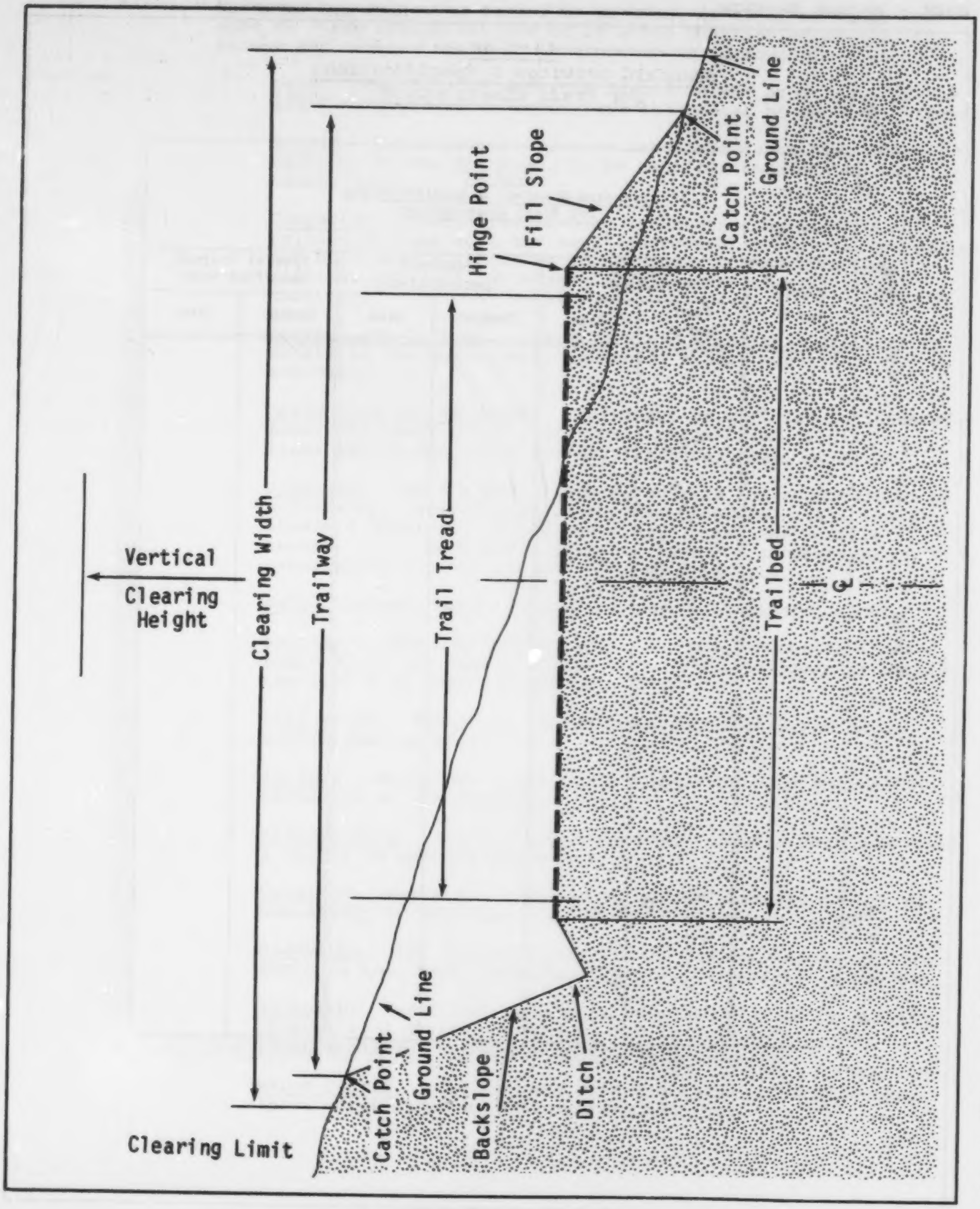


Figure 902-1.--Illustration of trail structure terms

Section 903 - Intent of Contract

The intent of the contract is to provide for the complete construction of the project described in the contract. Unless otherwise provided, the contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies and perform all work required to complete the project in accordance with drawings, specifications, and provisions of the contract.

Section 904 - Maintenance for Traffic

The contractor shall keep existing trails undergoing improvements open and maintained in such condition as to safely accommodate traffic. Temporary detours, approaches, or crossings and intersections with trails, roads, businesses, parking lots, and campgrounds also shall be provided and maintained in a safe and passable condition. No work that interferes or conflicts with traffic shall be performed until a plan for satisfactory handling of traffic has been submitted by the contractor and approved by the Contracting Officer. Specific requirements for detours are SHOWN ON THE DRAWINGS or in the SPECIAL PROJECT SPECIFICATIONS.

Before any suspension of work, the contractor shall take such precautions as may be necessary to prevent damage to the project, such as temporary detours, approaches, crossings, or intersections, and shall make provisions for normal drainage and minimization of erosion. All trailways shall be left in a condition suitable for traffic.

Any maintenance not attributable to use or maintenance necessary during suspensions resulting from fault or negligence of the contractor shall be the contractor's responsibility.

Section 905 - Control of Materials

All materials shall be transported and handled so as to preserve their quality and fitness for work.

Section 906 - Measurement & Payment

906.01 General

Measurement and payment for contract work will be made only for and under those pay items included in the SCHEDULE OF ITEMS. All other work and materials will be considered incidental to and included in the payment of the pay items in the SCHEDULE OF ITEMS.

When more than one class, size, or thickness is specified in the SCHEDULE OF ITEMS for any pay item, suffixes will be added to the item number to differentiate between the items to be bid on.

906.02 Determination of Quantities

The following measurements and calculations are used to determine contract quantities for payment:

For retaining walls, the front facial area will be measured for payment.

For items that are measured by the linear foot, station, or mile, measurements will be made along the centerline and parallel to the specified grade or foundation, unless otherwise SHOWN ON THE DRAWINGS.

For aggregates weighed for payment, the tonnage will be reduced by the amount of moisture content that exceeds the maximum percentage specified on Form FS-7700-94. For moisture determination, the daily average moisture content will be determined from not less than three representative samples of aggregate taken at random intervals each day that aggregate is being weighed.

For standard manufactured items, such as fence, wire, plates, rolled shapes, and pipe conduits identified by gage, weight, section dimensions, and the like, such identification shall be considered the nominal weights or dimensions. Unless controlled by tolerances in cited specifications, manufacturer's tolerances will be accepted.

906.03 Units of Measurement

Payment will be by units defined and determined according to U.S. standard measure and by the following:

(a) Cubic Yard. A measurement computed by one of the following methods:

(1) Excavation, Embankment, or Borrow. The measurement computed by the average-end-area method from measurements made longitudinally along a centerline or other reference line.

(2) Material in Place or Stockpiled. The measurement computed with dimensions of the in-place material. Computations may be made by the average-end-area method or prismoidal formula.

(3) Material in the Delivery Vehicle. The measurement computed using measurements of material in the hauling vehicles at the point of delivery. Vehicles shall be loaded to at least their water level capacity. Leveling of the loads may be required when vehicles arrive at the delivery point.

(b) Each. One complete unit, which may consist of one or more parts.

(c) MFBM. Thousand feet board measure (to nearest 0.01) based on nominal widths, thicknesses, and extreme usable length of each piece of lumber or timber actually incorporated in the job.

(d) Station. Measurement of 100 linear feet.

(e) Ton. Weight measurement of 2,000 pounds.

(f) Lump Sum. The quantities that denote one complete unit of work as required by or described in the contract, including necessary materials, equipment, and labor to complete the job.

(g) Square Yard. Measurement of 9 square feet in surface area.

(h) Square Foot. Measurement of 144 square inches in surface area.

(i) Mile. Measurement of 5,280 feet along a reference line.

(j) Linear Foot. Measurement of 12 inches along a reference line.

Section 907 - Material Sources

907.01
General

Commercial sources are not designated. Sources for materials on Government land, such as, but not limited to, soil, rock, or logs that are not available from trailway excavation or clearing operations will be designated.

Use of material sources other than those designated shall be approved in advance, in writing, by the Engineer.

907.02
Restoration

Material sources on Government land for rock, stone, or mineral soil shall be shaped and graded to make them stable and to prevent future erosion. Debris resulting from development of material sources shall be disposed of by scattering, unless otherwise specified in the SPECIAL PROJECT SPECIFICATIONS. Debris shall not be scattered within the clearing limits of trails or within roadsides. Stumps shall be cut off not more than 12 inches above the ground as measured on the uphill side of the stump.

Section 908 - Quality Control & Quantity Measurement

DESCRIPTION

908.01
Work

This work shall consist of providing quality control in conformance with the inspection of construction and quantity survey provisions of this contract to obtain completion of the project in accordance with the drawings, specifications, and requirements of the contract, and measuring quantities of completed work for payment. The contractor shall provide all personnel, equipment, and reports necessary to meet the requirements of the specification.

CONSTRUCTION

908.02
Certification
& Measurements

(a) Offsite Produced Materials. The contractor shall furnish certificates executed by the manufacturer, supplier, or vendor, stipulating that all offsite produced materials incorporated into the work meet the applicable requirements shown on the drawings or stated in the specifications. Each certificate shall apply to a single commodity or invoice. Incidental purchases needed to remedy minor shortages of material shall be certified by the contractor.

(b) Onsite Produced Materials or Work Processes. The contractor shall certify in writing that onsite produced materials and work processes have been accomplished in accordance with the contract specifications and drawings. Such certification shall be made prior to processing payment estimates and shall cover the same period as the subject payment estimate.

(c) Quantity Measurements. The contractor shall make all field measurements for computation of quantities for all work items. The contractor shall compute the quantities for periodic progress payments; the Engineer will compute the quantities for the final payment based on measurements taken by the contractor. All contractor measurements will be subject to verification by the Engineer. The contractor shall submit all field notes, calculation sheets, and other data used to determine quantities when the certifications noted in "a" and "b" above are submitted.

908.03
Records

As-built Drawings. The contractor shall maintain contract drawings depicting as-built conditions. The drawings shall be maintained in a current condition at all times until completion of the work. At the completion of contract work, the as-built drawings shall be given to the Engineer.

MEASUREMENT

908.04
Method

There will be no separate measurement for this item.

PAYMENT

908.05
Basis

Quality control will be considered incidental to other pay items in this contract and extra payment will not be given.

SECTION 910 EARTHWORK

Section 911 - Clearing & Grubbing

DESCRIPTION

911.01
Work

This work consists of clearing, grubbing, trimming, removing, and disposing of, or treatment of, live and dead timber, construction slash, and debris within the areas SHOWN ON THE DRAWINGS or DESIGNATED ON THE GROUND. This work shall include the removal and disposal of designated trees outside the clearing limits. Also included is the protection from injury or defacement of trees and other objects designated to remain and treatment or removal of damaged trees.

CONSTRUCTION

911.02
Clearing Limit

The area to be cleared shall be to the dimensions SHOWN ON FORM FS-7700-61 or 1 foot beyond fill or backslope catch points, whichever is greater.

911.03
Material To Be Cleared

All debris, trees, logs, limbs, branches, brush, plants, and other protruding obstructions within the clearing limits shall be removed and disposed of, except the following:

(a) Live, sound, and firmly rooted trees of the size SHOWN ON FORM FS-7700-61.

(b) Live brush, herbaceous plants, and trees between the trailway and the clearing limits that are less than 12 inches in height and less than 1/2 inch in diameter at ground line.

Except as provided above, all limbs and branches more than 1/2 inch in diameter that extend into the cleared area shall be cut flush with the tree trunks or stems or cut at the ground surface, as SHOWN ON FORM FS-7700-62.

911.04
Damaged Trees

Felling, cutting, and trimming methods shall not cause bark damage to standing timber. If damage does occur to standing trees, the injured area shall be treated with a coat of tree-surgery asphalt-based paint. Trees with major roots exposed by construction that are rendered unstable shall be felled and disposed of in accordance with Subsection 911.06.

911.05
Removal of Stumps

All stumps within the trailbed shall be removed. Stumps located between the edge of the trailbed and the edge of the trailway that cannot be cut flush with the finished slope, or are not tightly rooted, shall be removed.

911.06
Disposal of Clearing Slash, Logs, Stumps, Brush, & Roots

All felled trees, including designated trees outside the clearing limits, shall be limbed to a 4-inch diameter top.

All logs, limbs, lopped tops, brush, and grubbed stumps and roots shall be scattered on the downhill side of and outside the clearing limits, with the following exceptions:

(a) Limbs, brush, and lopped tops from trees felled on the uphill side of the clearing limits shall be scattered below the trailway, except where the sideslope above the trail is less than 10 percent; such material may be scattered above the trail.

(b) Logs may be left on the uphill side of the trail if they are placed so that they will not move into the clearing limits.

Debris from clearing and grubbing operations shall not be placed in streams, water courses, snow ponds, lakes, meadows, or in a location that will impede flow through or from drainage facilities.

MEASUREMENT

911.07 Method The quantity to be paid will be measured in accordance with Section 906.

The following will be considered incidental to other pay items, and extra payment will not be given unless listed in the SCHEDULE OF ITEMS:

(a) Removing trees with major roots exposed by construction.

(b) Removing or treating damaged trees.

PAYMENT

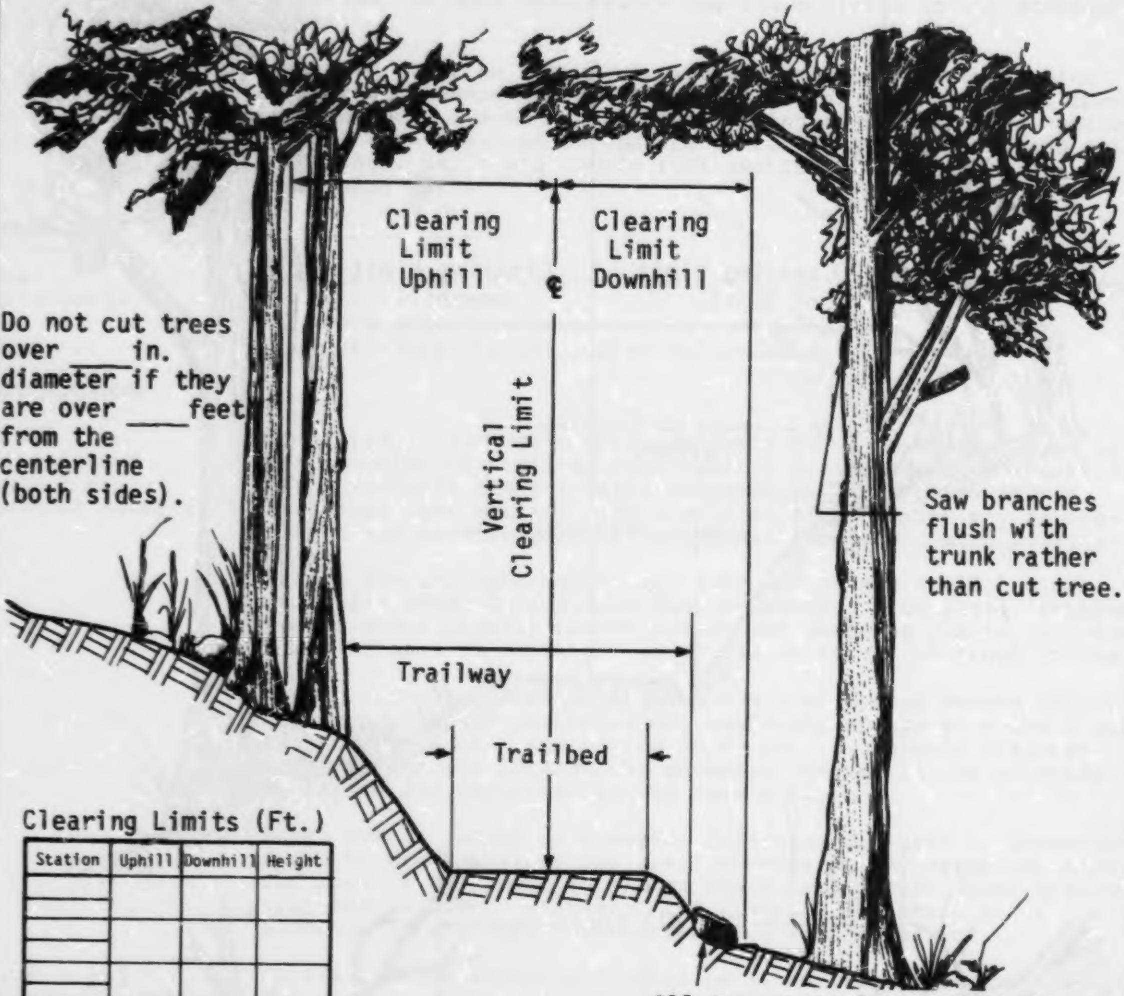
911.08 Basis The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
911(01)	Clearing and Grubbing	MI
911(02)	Clearing and Grubbing	STA
911(03)	Clearing and Grubbing	L.F.
911(04)	Clearing and Grubbing	L.S.
911(05)	Clearing	MI
911(06)	Clearing	STA
911(07)	Clearing	L.F.
911(08)	Clearing	L.S.
911(09)	Grubbing	MI
911(10)	Grubbing	STA
911(11)	Grubbing	L.F.
911(12)	Grubbing	L.S.
911(13)	Individual Removal and Disposal	EA
911(14)	Individual Removal and Disposal	L.S.

USDA - Forest Service

Clearing Limits



Do not cut trees over ____ in. diameter if they are over ____ feet from the centerline (both sides).

Saw branches flush with trunk rather than cut tree.

All trees ____ in. or less in diameter shall be cut if they are within ____ feet of centerline (both sides).

Clearing Limits (Ft.)

Station	Uphill	Downhill	Height

Stump Height Requirements* (Inches)

Stump Position	Side Slope	Uphill	Downhill
Stumps left in place between the trailway and clearing limits	Side slope less than 10%		
	Side slope over 10%		
Stumps outside the clearing limits	Side slope less than 10%		
	Side slope over 10%		

*All heights measured from uphill side of stumps.

Trail Name ____________

Trail Number ____________

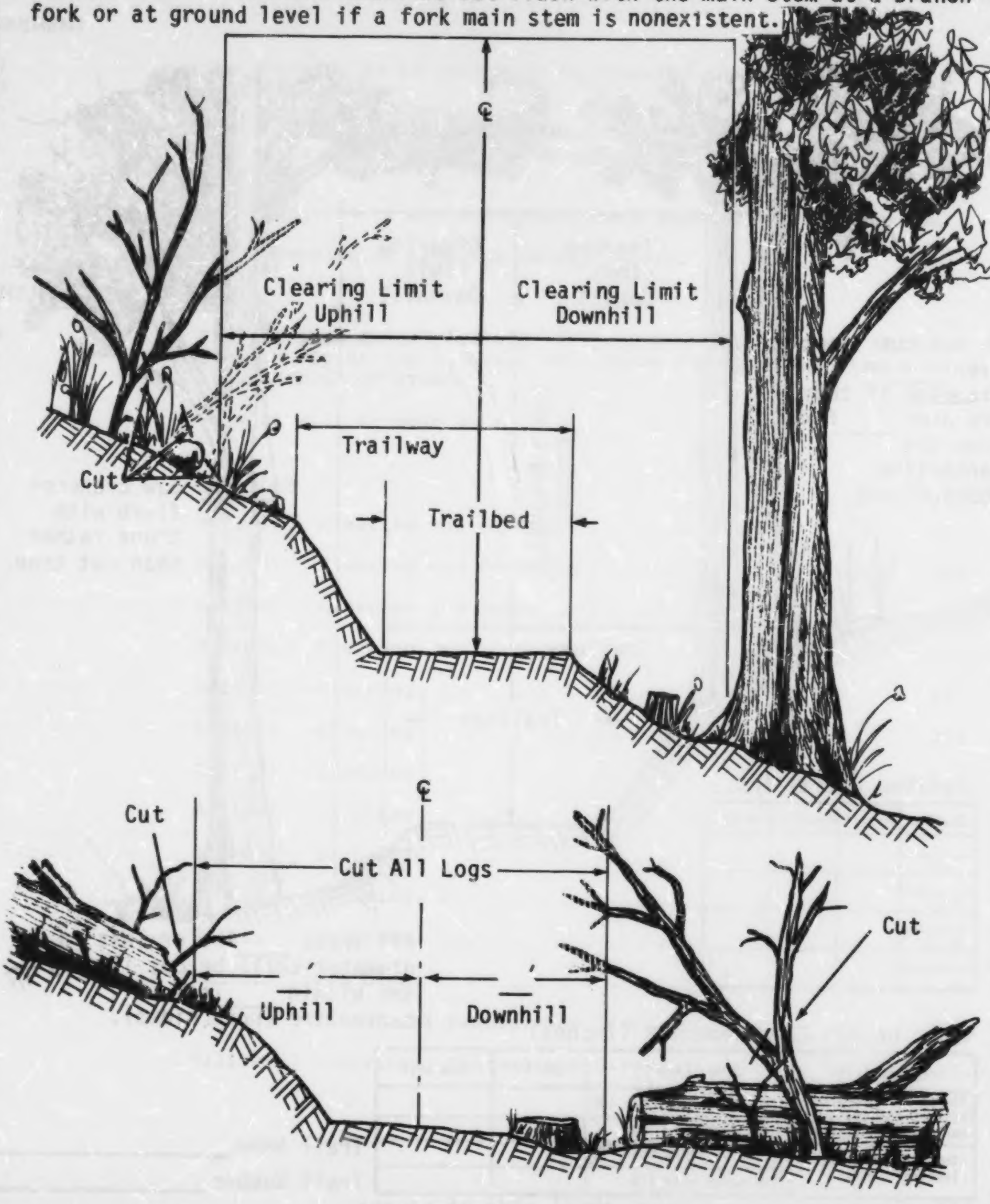
911
.08

FS-7700-61 (6/84)

911
.08

Clearing Limits

Brush extending into the clearing limits that is over 12 inches in height and 1/2 inch in diameter shall be cut flush with the main stem at a branch fork or at ground level if a fork main stem is nonexistent.



Section 912 - Excavation & Embankment

DESCRIPTION

**912.01
Work**

This work shall consist of the excavation and placement of all excavated material, regardless of its nature, from within the trailway limits or from other sources SHOWN ON THE DRAWINGS or described in the SPECIAL PROJECT SPECIFICATIONS, except for material included under other pay items listed in the SCHEDULE OF ITEMS.

Included shall be the excavation and embankment construction required to shape and finish the trailbed, ditches, backslopes, fill slopes, drainage dips, and passing sections. Also included is all work required to construct shallow stream fords and gulley crossings, talus and rubble rock sections, and rock or log retaining walls.

MATERIALS

**912.02
Requirements**

Materials shall meet the requirements of the following sections:

961-Stone and Rock
962-Material for Timber Structures

CONSTRUCTION

**912.03
Utilization &
Disposal of
Excavated Material**

All suitable excavated material shall be conserved and used in the construction of trailway embankments, trail tread, and backfill for structures and for other purposes SHOWN ON THE DRAWINGS. Excavated rock suitable for specified project work may be conserved and used in place of materials from designated sources.

Before placing embankment, all duff and litter shall, unless otherwise SHOWN ON THE DRAWINGS, be removed from within trailway limits and uniformly spread outside of clearing limits, not more than 4 inches in depth and so placed as to not obstruct drainage.

Excess and unsuitable excavation shall be placed beyond the downslope edge of the trailbed, uniformly spread to a depth not exceeding 4 inches and placed so as not to obstruct drainage. This depth shall include any material removed in the grubbing operation and deposited in the same area.

Rocks over 4 inches in greatest dimension not used in construction shall be placed beyond the trailbed edge on the downslope side. The tops of all rocks so placed shall be 6 inches lower than the trailbed surface. Placement and distribution shall ensure no blockage of drainage or creation of a windrow effect.

**912.04
Trailway Excavation
& Embankment**

Excavation and embankment shall be accomplished to meet the lines and grades SHOWN ON THE DRAWINGS and DESIGNATED ON THE GROUND.

Minor deviations from the trail alignment and grade, as defined in the SPECIAL PROJECT SPECIFICATIONS, will be permitted to avoid or minimize disturbance of physical terrain.

The trailway cross section shall be constructed in accordance with Form FS-7700-63.

Unless otherwise SHOWN ON THE DRAWINGS, the trailbed shall be outsloped 3/4 of an inch to 1-1/4 inches per foot of width.

All embankment shall be constructed of compacted mineral soil. All disturbed soil within the trailbed area shall be recompacted.

Where a safety or traffic barrier is SHOWN ON THE DRAWINGS, the trailbed shall be widened by the amount specified under Section 953 for the particular area shown.

Any rock along or above backslopes that becomes unstable as a result of excavation operations shall be removed and utilized or disposed of in accordance with Subsection 912.03.

Finished slopes shall conform reasonably to the lines SHOWN ON THE DRAWINGS. The finished slope shall be left in a roughened condition to facilitate vegetative growth.

912.05 Trailbed Width & Finish

The trailbed width and finish shall be as SHOWN ON FORMS FS-7700-63 and FS-7700-64.

912.06 Talus or Rubble Rock Sections

Through talus or rubble rock slide areas where little or no soil is present, trailway construction shall be in accordance with Form FS-7700-65. All voids in and under the trailbed surface shall be filled with rock and fine mineral soil to the depth shown to provide a firm trailbed. At least 50 percent of the hand-placed outer rocks shall be a minimum of 1 cubic foot in size.

912.07 Retaining Walls

With written approval of the Engineer, trailbed sections utilizing log or rock retaining walls may be constructed in place of full-bench construction. This construction shall be in accordance with Section 934 or Section 935.

912.08 Widened Trailbed

Where rock or log barriers are SHOWN ON THE DRAWINGS, the trailbed shall be widened by the amount indicated in Section 953.

912.09 Drainage Dips

Drainage dips shall be constructed in accordance with Form FS-7700-66.

When SHOWN ON THE DRAWINGS, a rock spillway shall be constructed at the water spillpoint in accordance with Section 923.

912.10 Ditches

Ditches shall be to the dimensions SHOWN ON FORM FS-7700-64. The finished ditches shall be free of obstructions, such as loose rocks, roots, and sticks.

912.11 Trail Passing Sections

Where SHOWN ON THE DRAWINGS, widened or alternate trail passing sections shall be constructed in accordance with Form FS-7700-67.

912.12 Shallow Stream Fords & Gully Crossings--Rock & Log Structures

Where SHOWN ON THE DRAWINGS, shallow stream fords and gully crossings shall be constructed in accordance with Form FS-7700-68 for a rock structure and Form FS-7700-69 for a log structure.

MEASUREMENT

912.13 Method

The quantity to be paid for will be measured in accordance with Section 906.

The following will be considered incidental to other pay items and extra payment will not be given:

(a) Widened trailbed for barriers.

(b) Drainage dips.

(c) Talus or rubble rock sections.

(d) Retaining walls in place of full-bench construction.

Unless listed in the SCHEDULE OF ITEMS, the following will be considered incidental to excavation:

(a) Shallow stream fords and gully crossings.

(b) Trail passing sections.

(c) Ditches.

(d) Rock spillway.

PAYMENT

912.14 Basis

The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

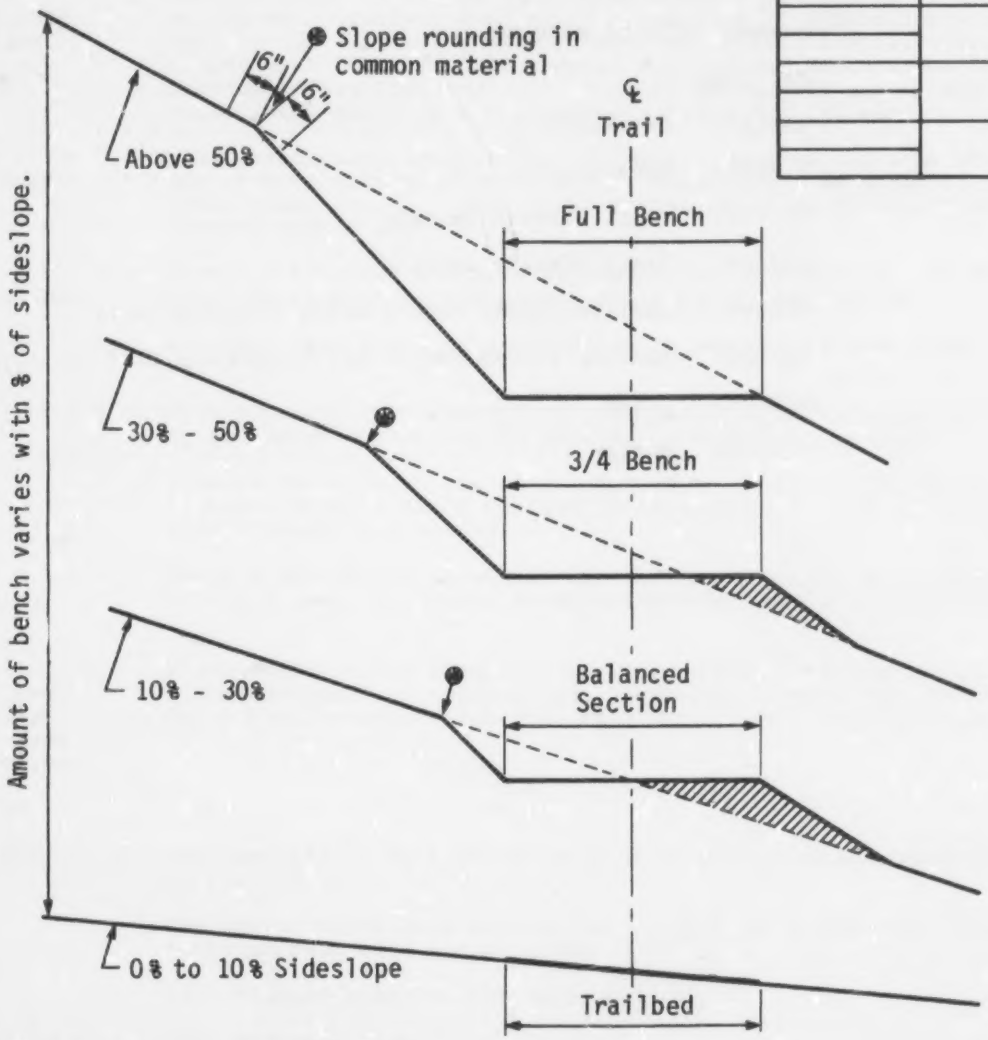
Pay Item		Pay Unit
912(01)	Excavation	L.F.
912(02)	Excavation	MI
912(03)	Trail Passing Section	L.F.
912(04)	Trail Passing Section	MI
912(05)	Shallow Stream Ford & Gully Xing-Rock Str. .	EA
912(06)	Shallow Stream Ford & Gully Xing-Log Str. . .	EA
912(07)	Ditch	L.F.
912(08)	Borrow	C.Y.

912
.14

Typical Trailway Cross Sections

Trailbed Width

Location	Trailbed Width (Ft.)



Trail Name ____________________
Trail Number ____________________
Segment ________ To ____________

Trailbed & Slope Finish

Slope Finish

Remove roots over ____ inches in diameter that protrude from the backslope.

Trailbed Finish

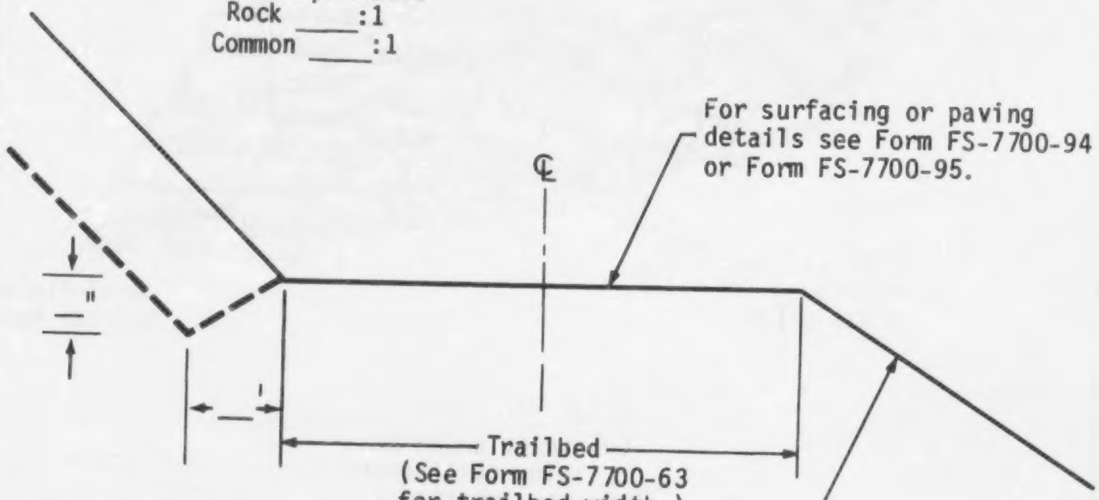
Remove loose rock and stone on the trailbed surface over ____ inches in the smallest dimension.

Remove embedded rock and stone that protrude more than ____ inches above the trailbed.

Remove roots which protrude more than ____ inches above the trailbed.

912
.14

Backslope Ratio
Rock ____:1
Common ____:1



For surfacing or paving details see Form FS-7700-94 or Form FS-7700-95.

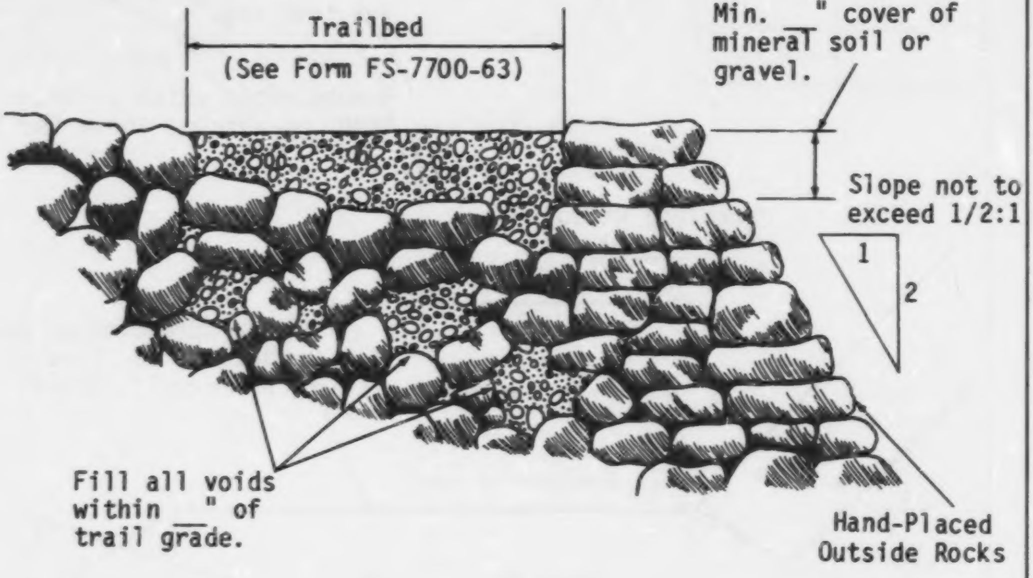
Trailbed
(See Form FS-7700-63 for trailbed width.)

Fill Slope Ratio
Rock ____:1
Common ____:1

Trail Name ____________________
Trail Number ____________________
Segment ______ To ____________

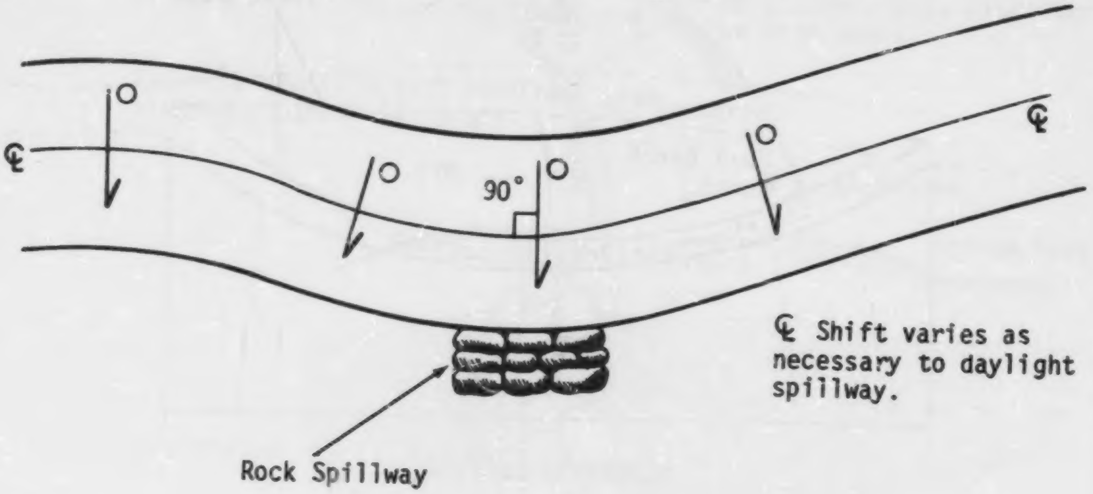
912
.14

Talus & Rubble Rock Section


Trailbed
(See Form FS-7700-63)
Min. __" cover of mineral soil or gravel.
Slope not to exceed 1/2:1
1
2
Fill all voids within __" of trail grade.
Hand-Placed Outside Rocks

NOTE:
Construct tread by building out rather than by removing material from the inner bank.

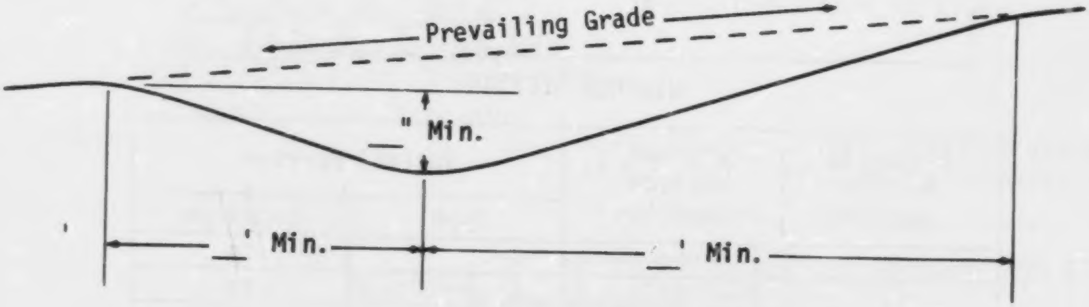
Drainage Dip



℄ Shift varies as necessary to daylight spillway.

Maintain 3/4" to 1-1/4":1' outslope (O ⟶)
and trailbed width as shown
on Form FS-7700-63.

PLAN VIEW



PROFILE

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FS-7700-66 (6/84)

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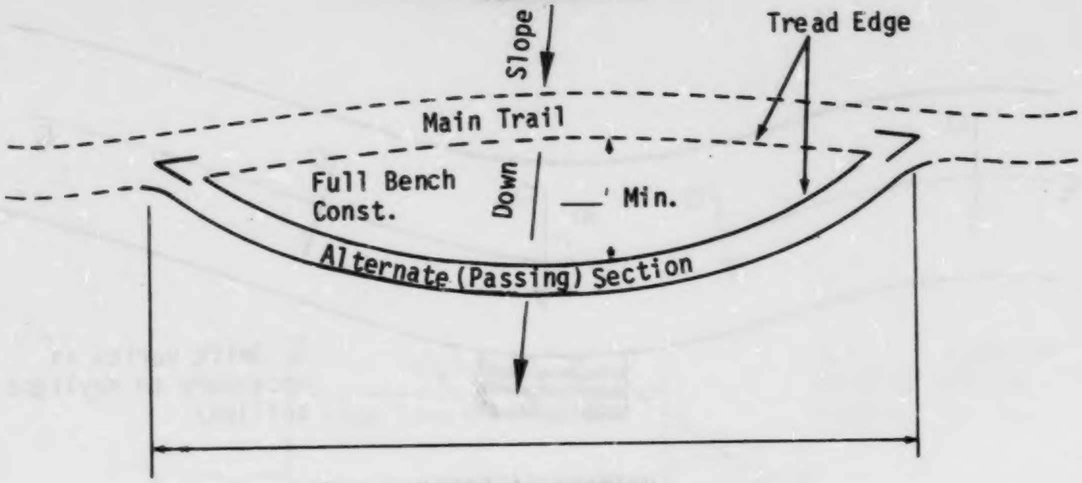
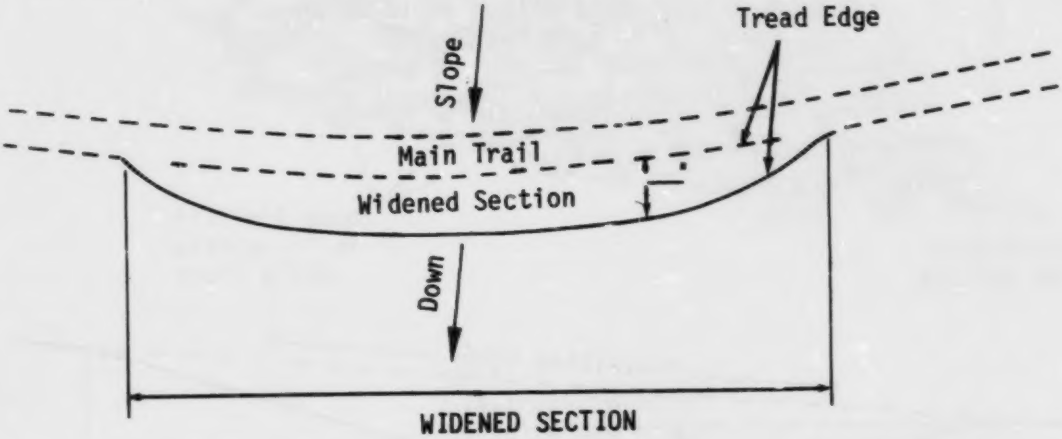
Trail Passing Sections



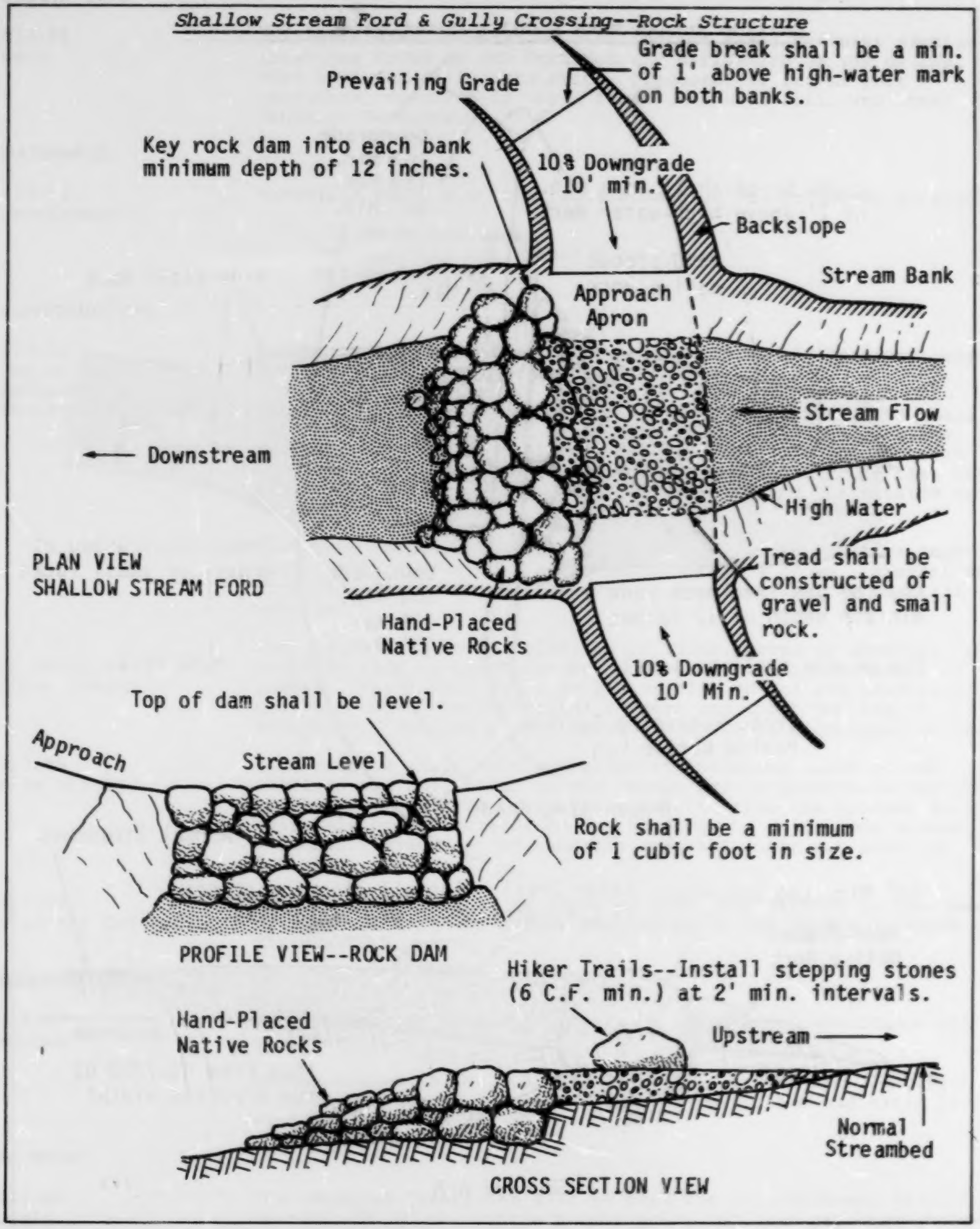
ALTERNATE SECTION



WIDENED SECTION

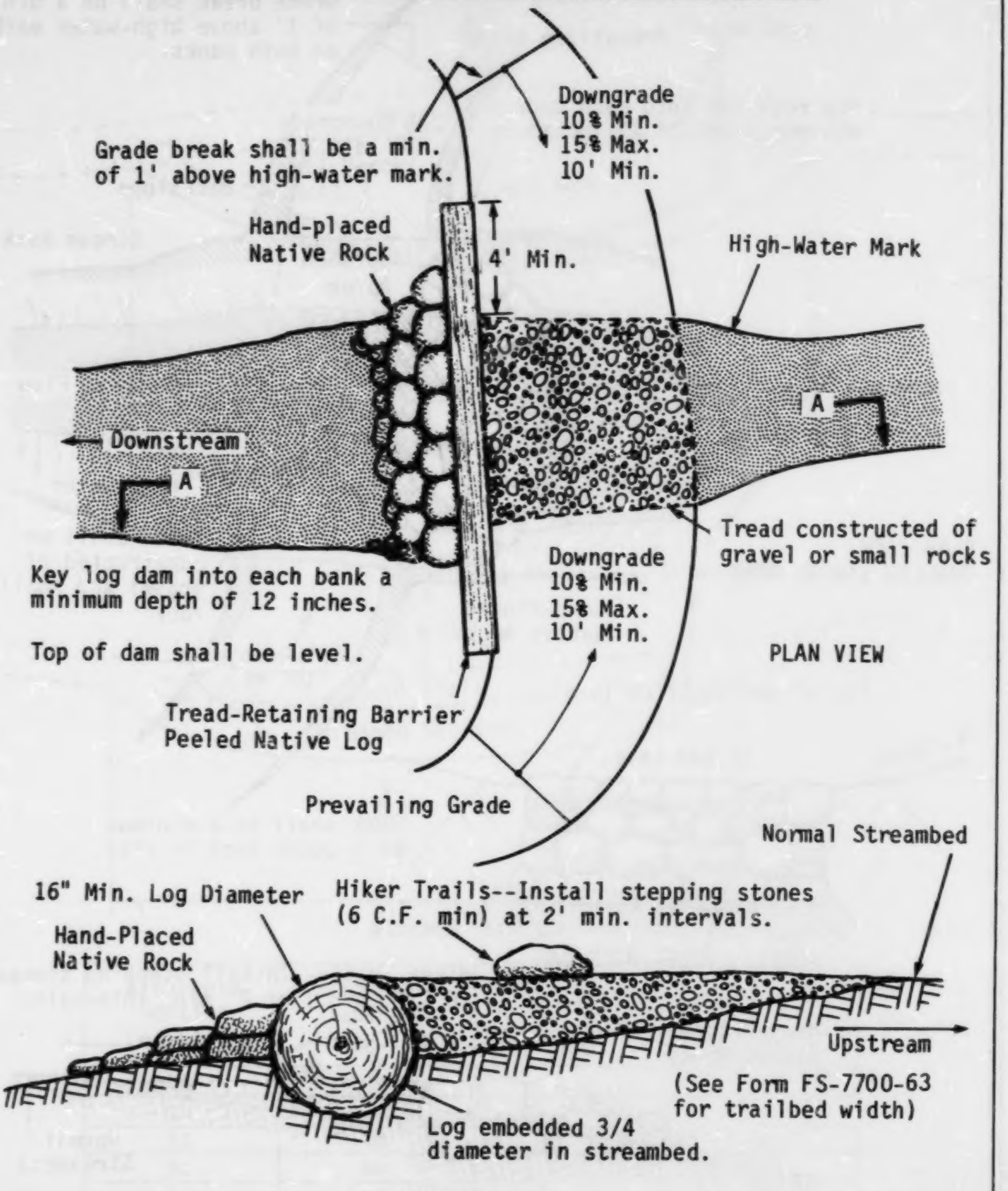
Alternate Section Location	Widened Section Location	Install Barrier	
		Type	Location
to	to		to
to	to		to
to	to		to
to	to		to
to	to		to

Shallow Stream Ford & Gully Crossing--Rock Structure


Grade break shall be a min. of 1' above high-water mark on both banks.
Prevailing Grade
Key rock dam into each bank minimum depth of 12 inches.
10% Downgrade 10' min.
Backslope
Stream Bank
Approach Apron
Stream Flow
Downstream
High Water
Tread shall be constructed of gravel and small rock.
PLAN VIEW
SHALLOW STREAM FORD
Hand-Placed Native Rocks
10% Downgrade 10' Min.
Top of dam shall be level.
Approach
Stream Level
Rock shall be a minimum of 1 cubic foot in size.
PROFILE VIEW--ROCK DAM
Hiker Trails--Install stepping stones (6 C.F. min.) at 2' min. intervals.
Hand-Placed Native Rocks
Upstream
Normal Streambed
CROSS SECTION VIEW

912
.14

Shallow Stream Ford & Gully Crossing--Log Structure


Grade break shall be a min. of 1' above high-water mark.
Downgrade 10% Min. 15% Max. 10' Min.
Hand-placed Native Rock
4' Min.
High-Water Mark
Downstream
A
A
Tread constructed of gravel or small rocks
Key log dam into each bank a minimum depth of 12 inches.
Top of dam shall be level.
Downgrade 10% Min. 15% Max. 10' Min.
PLAN VIEW
Tread-Retaining Barrier Peeled Native Log
Prevailing Grade
Normal Streambed
16" Min. Log Diameter
Hiker Trails--Install stepping stones (6 C.F. min) at 2' min. intervals.
Hand-Placed Native Rock
Upstream
(See Form FS-7700-63 for trailbed width)
Log embedded 3/4 diameter in streambed.
SECTION A-A

Section 913 - Turnpike

DESCRIPTION

913.01 Work

This work shall consist of constructing trail turnpike sections at locations SHOWN ON THE DRAWINGS and DESIGNATED ON THE GROUND. Work includes ditch excavation, placement of log or rock retainers, nonwoven or woven fabric, mineral soil, and other drainage features.

MATERIALS

913.02 Requirements

Materials shall meet the requirements of the following sections:

961-Stone and Rock
962-Material for Timber Structures
964-Geotextiles

CONSTRUCTION

913.03 Log or Rock Retainers & Backfill Material

Rocks, stumps, and other obstructions that would protrude above the turnpike tread shall be removed from the trailway.

Native logs or rocks called for in the SCHEDULE OF ITEMS shall be laid in a continuous row along each shoulder of the turnpike section. The two rows of logs or rocks shall be bedded to be stable and parallel and to give them approximately the same top elevation. Wooden stakes shall be driven along the outside edge of each row of logs.

The space between the two rows of logs or rocks shall be backfilled with compacted mineral soil to form a crown. Mineral soil from side ditches or borrow sources shall be used as backfill material.

913.04 Nonwoven or Woven Fabric

When called for in the SCHEDULE OF ITEMS, woven or nonwoven fabric shall be laid on the turnpike section before fill material is placed. The fabric shall be placed flat on the trailbed longitudinally down the centerline between and under the log or rock retainers. Joining pieces of fabric shall be overlapped 24 inches.

913.05 Side Ditches

Side ditches shall be constructed at locations SHOWN ON THE DRAWINGS and DESIGNATED ON THE GROUND and in accordance with Form FS-7700-70. Unusable material excavated from the ditches shall be uniformly spread outside of the trailway to depths not exceeding 4 inches. Placement of unusable material shall not obstruct drainage.

913.06 Drainage Control

Leadoff ditches shall be provided from side ditches on the lower side of the trail at points DESIGNATED ON THE GROUND or SHOWN ON THE DRAWINGS.

MEASUREMENT

913.07 Method

The quantity to be paid for will be measured in accordance with Section 906.

Unless listed in the SCHEDULE OF ITEMS, leadoff and side ditches will be considered incidental to other pay items and extra payment will not be given.

PAYMENT

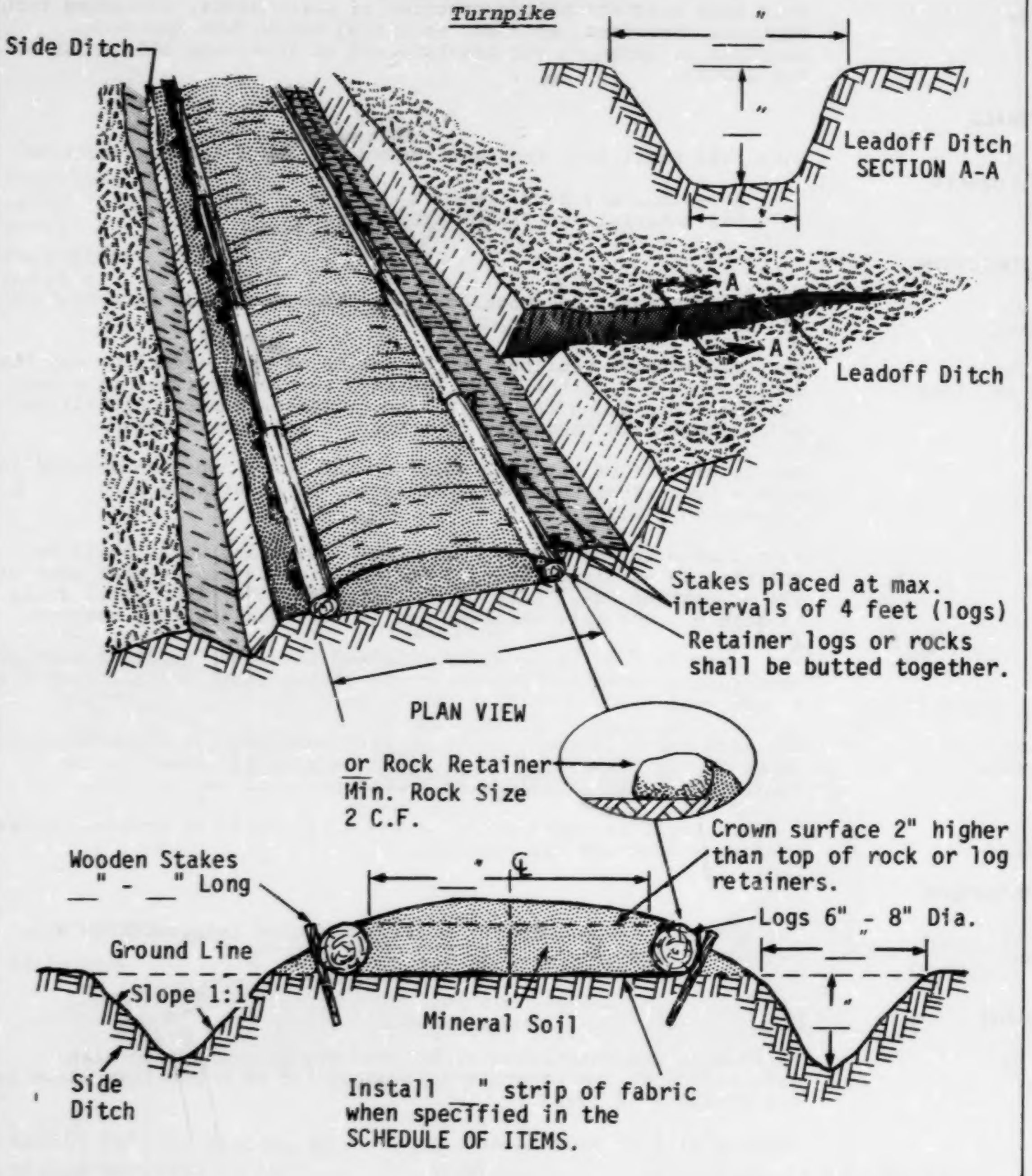
913.08 Basis

The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

Pay Item		Pay Unit
913(01)	Turnpike--Rock Retainer	L.F.
913(02)	Turnpike--Log Retainer	L.F.
913(03)	Side Ditch	L.F.
913(04)	Nonwoven Fabric	S.Y.
913(05)	Woven Fabric	S.Y.
913(06)	Leadoff Ditches	L.F.
913(07)	Borrow	C.Y.

913
.08

Turnpike



Trail Name________________
Trail Number______________
Segment________To___________

Section 914 - Switchbacks

DESCRIPTION

914.01 Work

This work consists of construction of switchbacks, including turn sections, barriers, ditches, retaining walls, and approach sections as SHOWN ON THE DRAWINGS and at locations DESIGNATED ON THE GROUND.

MATERIALS

914.02 Requirements

Materials shall meet the requirements of the following sections:

961-Stone and Rock
962-Material for Timber Structures

CONSTRUCTION

914.03 General

Switchbacks shall be constructed in accordance with Form FS-7700-71 and as DESIGNATED ON THE GROUND.

914 .01

914.04 Turn Sections

The turn-section trailbed on the inside of the centerline and the entire trailbed of the upper approach section shall be in a cut. The backslope along the upper edge of the turn section shall be uniform with the backslope of the upper approach sections.

The lower half of the turn sections and lower approach section in rubble rock areas shall be constructed in accordance with Subsection 912.06.

When listed in the SCHEDULE OF ITEMS, retaining walls shall be constructed on slopes over 50 percent, in accordance with Section 934 or Section 935. Backslopes in rubble rock slide areas shall be stable. Unstable material and loose rocks shall be removed.

The lower half of the turn section and the lower approach section constructed on 30 to 50 percent sideslopes shall be constructed on a compacted fill.

914.05 Barriers

Barriers shall be constructed at each switchback, unless otherwise SHOWN ON THE DRAWINGS. The type of barrier as listed in the SCHEDULE OF ITEMS shall be in accordance with Section 953.

914.06 Ditches

A ditch shall be constructed on the upper approach section, unless otherwise SHOWN ON THE DRAWINGS.

MEASUREMENT

914.07 Method

The quantity to be paid for will be measured in accordance with Section 906.

PAYMENT

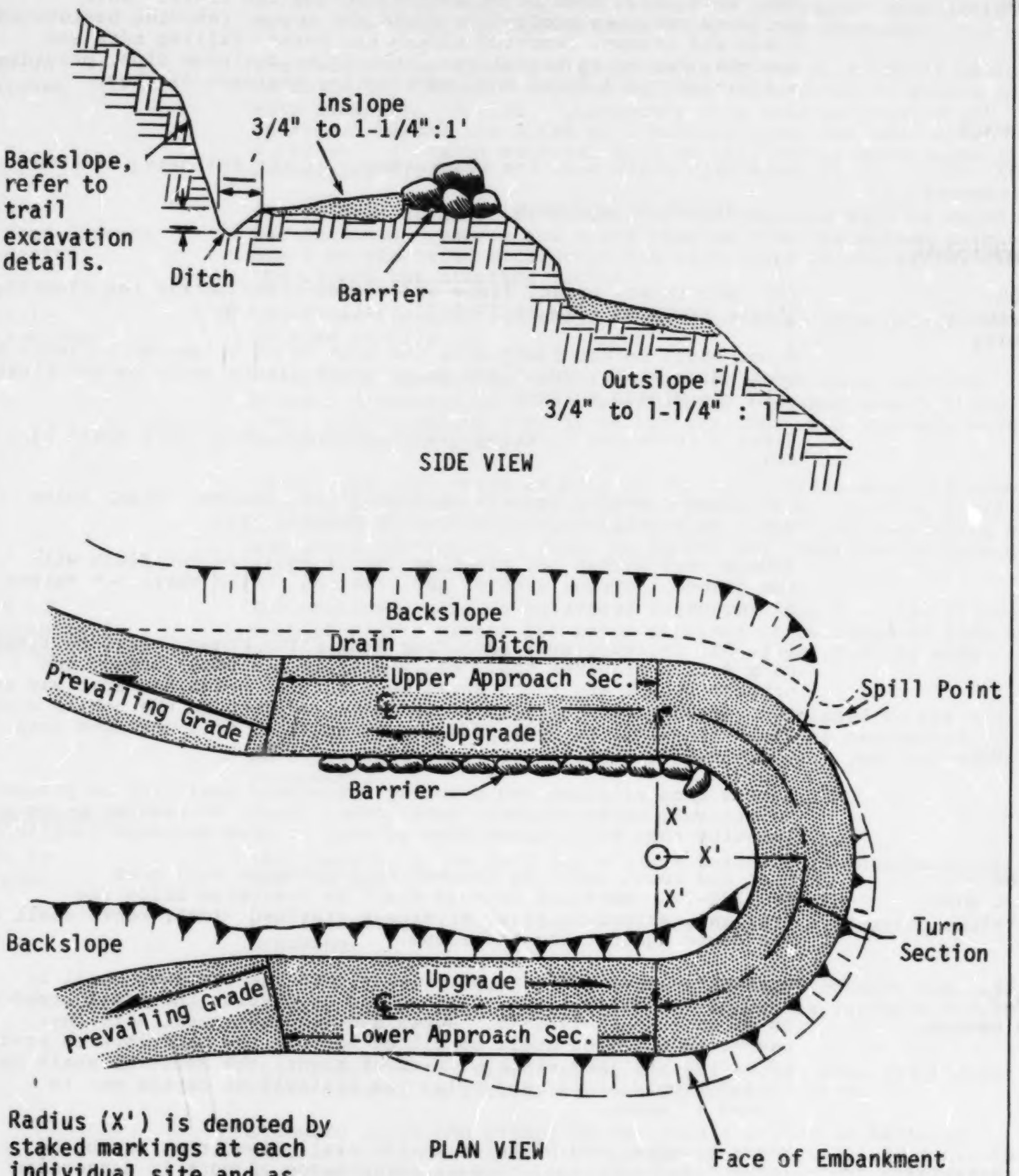
914.08 Basis

The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
914(01)	Switchbacks	EA
914(02)	Ditch	L.F.

Switchback Details



Radius (X') is denoted by staked markings at each individual site and as SHOWN ON THE DRAWINGS.

914
.08

Section 915 - Trail Reconstruction

DESCRIPTION

915.01
Work

This work shall consist of reconstructing the trail. Work includes removing protruding rocks and roots, removing designated trees and stumps, removing slough and berms, filling ruts and troughs, reshaping backslopes, installing drainage dips, providing a finished trail tread and constructing drainage ditches.

MATERIALS

915.02
Requirements

Materials shall meet the requirements of the following section:

961-Stone and Rock

CONSTRUCTION

915.03
Clearing &
Grubbing

915
.01

(a) All trees, brush, limbs and downed trees within the clearing limits SHOWN ON FORM FS-7700-72 shall be removed.

Limbs shall be cut flush with the tree trunk so as not to leave a protruding stub. Brush and small woody plants shall be cut flush with the ground surface.

Trees outside the clearing limits that are DESIGNATED shall be felled.

(b) Stumps within the trailbed shall be removed. Stump holes shall be backfilled with compacted mineral soil.

Stumps left within the clearing limits shall be cut flush with the ground. Stumps outside the clearing limits shall not exceed 12 inches in height.

(c) All felled trees, including DESIGNATED trees, shall be limbed to a 4-inch diameter top. All limbs, lopped tops, brush, and grubbed stumps and roots shall be scattered below the trailway and outside the clearing limits. Logs may be left on the uphill side of the trail if they are placed so that they will not move into the clearing limits.

Debris from clearing and grubbing operations shall not be placed in streams, water courses, snow ponds, lakes, or meadows or in a location that will impede flow through or from drainage facilities.

915.04
Rock & Root
Removal

Rock and roots shall be removed in accordance with Form FS-7700-72. Material removed shall be scattered below the trailway, except in areas of excess trailbed width; rocks shall be windrowed against the backslope.

915.05
Slough &
Berm Removal

Suitable slough and berm material within the trailway shall be used to reconstruct the trailbed and to develop the trail tread as SHOWN ON FORM FS-7700-73. Rocks and excess mineral soil that cannot be utilized shall be placed against the backslope in areas of excess trailbed width. In other areas, the material shall be spread evenly beyond and below the trailway at depths not to exceed 4 inches.

915.06
Fill Material

Ruts, troughs, and potholes in the trail tread that cannot be leveled and outsloped through performance of work in Subsection 915.05 shall be filled with compacted mineral soil and shaped in accordance with Form FS-7700-73. Mineral soil may be obtained from removed slough and berm material, from ditch excavation, or from approved borrow sources.

915.07 Installing Drainage Dips

Drainage dips shall be constructed at locations SHOWN ON THE DRAWINGS or DESIGNATED ON THE GROUND. Construction shall be in accordance with Form FS-7700-74.

A rock spillway shall be constructed in accordance with Section 923 at the water spillpoint when SHOWN ON THE DRAWINGS.

915.08 Ditches

The location of ditches will be SHOWN ON THE DRAWINGS or DESIGNATED ON THE GROUND. Ditches will be constructed in accordance with Subsection 912.10. Unsuitable excavated material shall be spread beyond the ditch to a uniform depth not exceeding 4 inches. Suitable material will be utilized in accordance with Subsection 915.06.

915.09 Stream Channel Cleaning

The channel areas to be cleaned of obstructions will be SHOWN ON THE DRAWINGS. Debris and rocks removed from the stream channel shall be scattered outside of the sideslopes of the stream channel and beyond the clearing limits.

915.10 Check Dams

Check dam construction shall be in accordance with details SHOWN ON FORM FS-7700-75.

Check dams for gullies shall consist of sound logs (10-inch minimum diameter) or of a row of stones (minimum size 2 cubic feet) placed across a gully in the trailbed with the ends securely embedded in the banks.

Check dams that serve as part of the trail tread shall be constructed to provide a step 6 to 10 inches high. The log shall be flattened on the top to provide a step. Backfill consisting of compacted mineral soil shall be placed and compacted to form a level trail tread.

915.11 Reshaping & Finishing Trailbed

The trailbed shall be outsloped 3/4 of an inch to 1-1/4 inches per foot of width, except for upper sections of switchbacks that shall be insloped 3/4 of an inch to 1-1/4 inches per foot of width and turnpike sections.

The trailbed shall be firm and smooth and finished to the width SHOWN ON FORM FS-7700-72 for all trail sections designated for rock and root removal, slough and berm removal, and fill material placement.

MEASUREMENT

915.12 Method

The quantity to be paid for will be measured in accordance with Section 906.

The following will be considered incidental to Clearing and Grubbing:

(a) Felling and disposal of designated trees outside the clearing limits, except when individual tree removal is included in the SCHEDULE OF ITEMS.

(b) Removing and disposing of stumps, except when individual stump removal is included in the SCHEDULE OF ITEMS.

Standing trees and stumps larger than 4 inches in diameter (measured 6 inches above the ground on the uphill side) will be measured and paid for separately when SHOWN ON THE SCHEDULE OF ITEMS. Otherwise, all trees and stumps designated for removal will be considered incidental to Clearing and Grubbing. Unless listed in the SCHEDULE OF ITEMS, consider the following incidental to Trail Reconstruction:

(a) Slough and Berm Removal.

(b) Drainage Dips.

(c) Rock Spillways.

(d) Ditches.

(e) Check Dams.

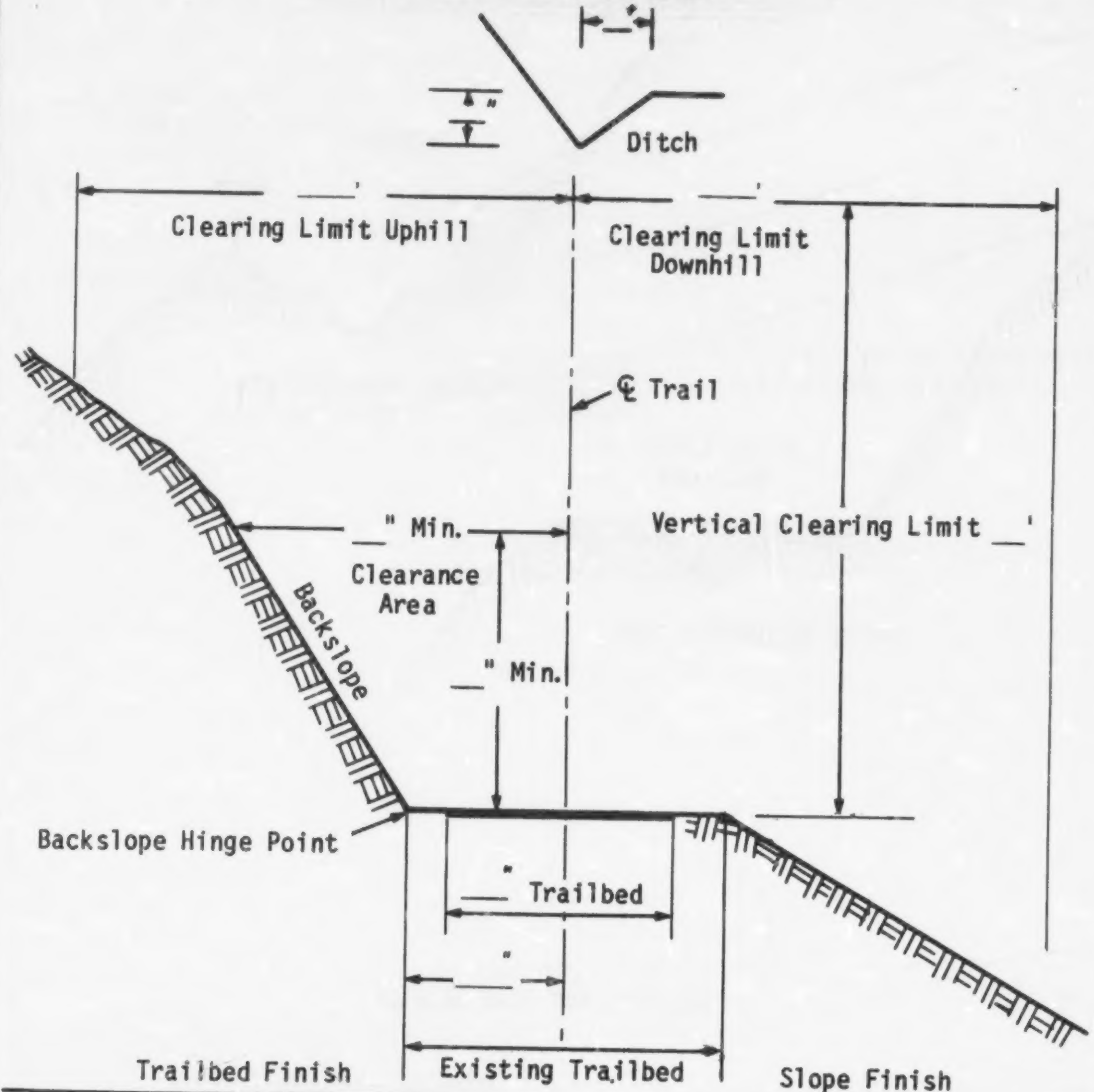
PAYMENT

915.13 Basis The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

915 .12

Pay Item		Pay Unit
915(01)	Trail Reconstruction	MI
915(02)	Trail Reconstruction	L.F.
915(03)	Clearing & Grubbing	L.F.
915(04)	Clearing & Grubbing	MI
915(05)	Individual Tree Removal	EA
915(06)	Individual Stump Removal	EA
915(07)	Slough & Berm Removal	L.F.
915(08)	Slough & Berm Removal	MI
915(09)	Borrow	C.Y.
915(10)	Drainage Dips	EA
915(11)	Rock Spillways	EA
915(12)	Ditches	L.F.
915(13)	Stream Channel Cleaning	EA
915(14)	Check Dams	EA

Reconstruct Trailway



Trailbed Finish

Remove loose rock over ____ inches in smallest dimension. Remove rocks and roots which protrude more than ____ inches above the trailbed.

Slope Finish

Remove roots over ____ inches in diameter that protrude from the backslope.

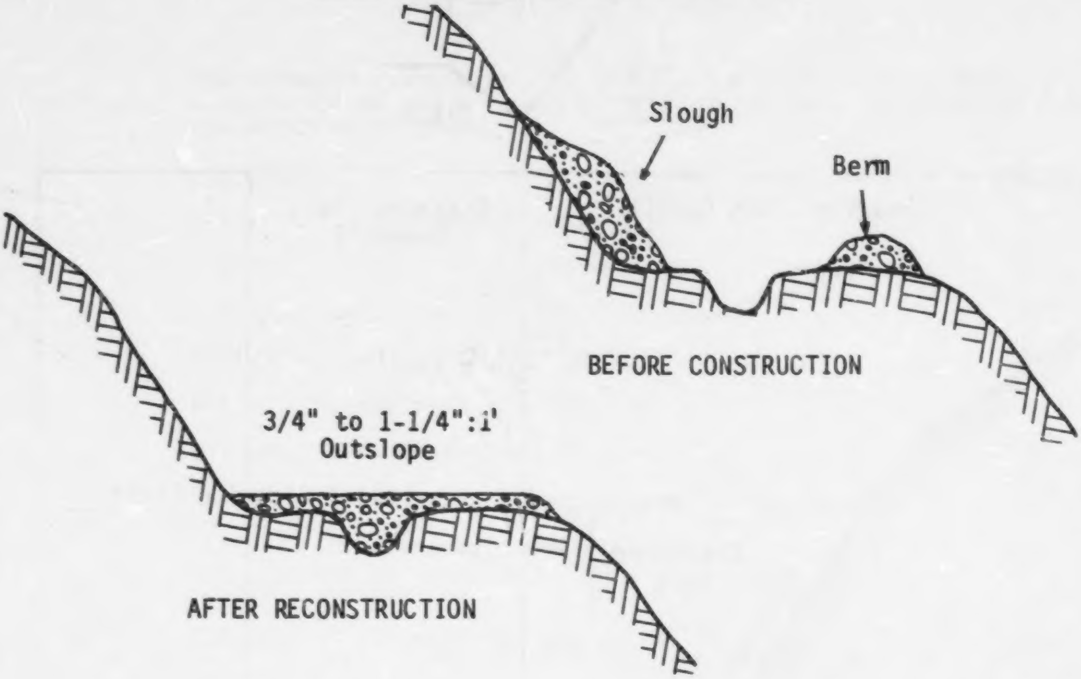
TYPICAL CROSS SECTION

Trail Name____________
Trail Number____________
Segment______To ________

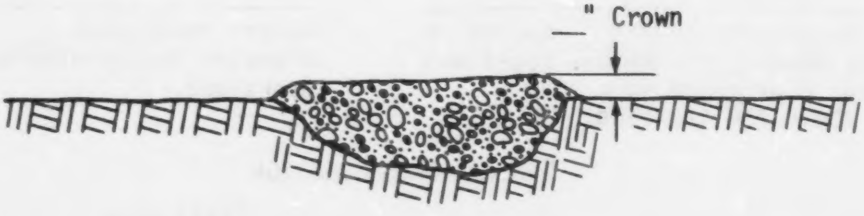
FS-7700-72 (6/84)

915
.13

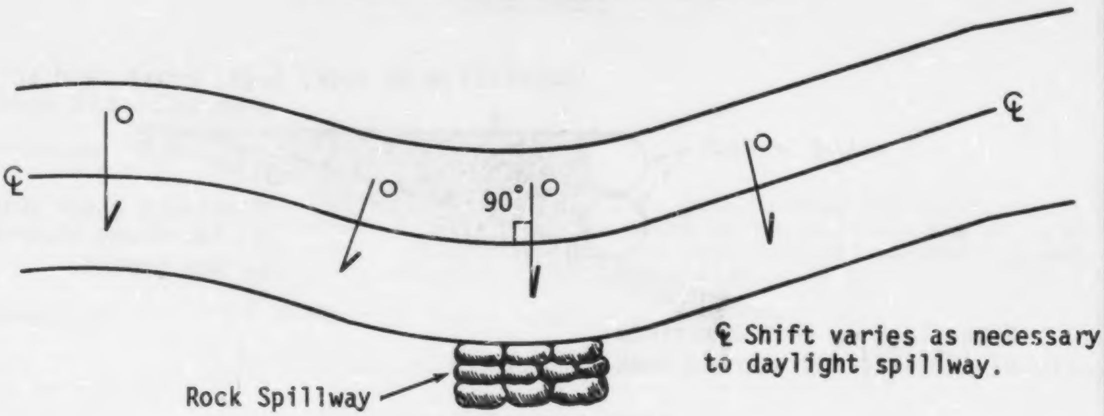
Reconstruct Trailway--Fill Sections



MEADOWS AND FLAT SLOPES



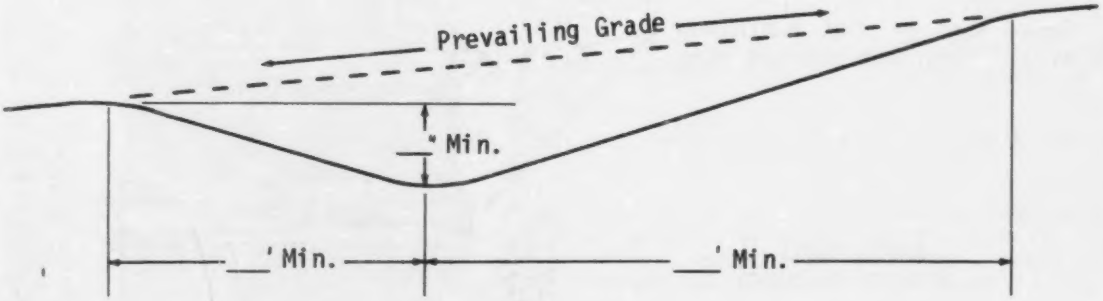
Reconstruct Trailway--Drainage Dip



℄ Shift varies as necessary to daylight spillway.

Maintain 3/4" to 1-1/4":1' outslope (○——>) and trailbed width.

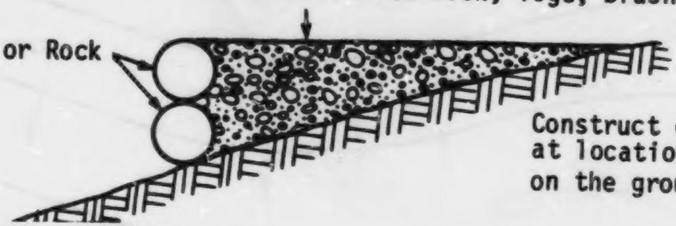
PLAN VIEW



PROFILE

915
.13

Check Dams

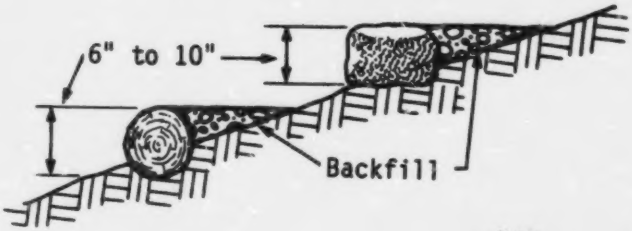


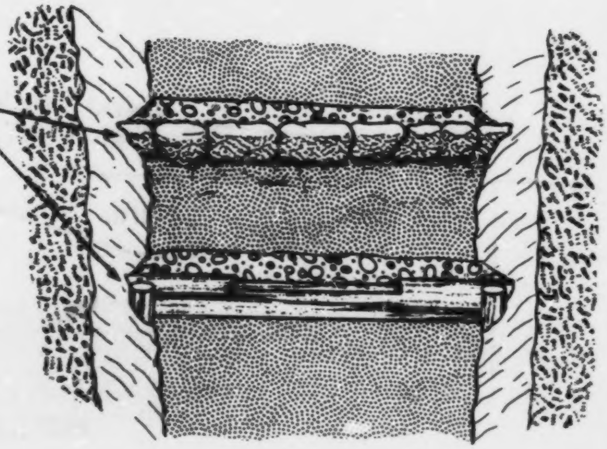
Backfill with rock, logs, brush, and soil.

Construct check dams at locations staked on the ground.

Embed logs or rock a minimum of 12" into undisturbed bank.

CHECK DAMS IN GULLIES





Embed logs or rock a minimum of 12" into undisturbed bank.

CHECK DAMS
ACROSS TRAILBED

SECTION 920 DRAINAGE

Section 921 - Culverts

DESCRIPTION

921.01
Work

This work consists of furnishing and installing culverts and constructing rock culverts as SHOWN ON THE DRAWINGS and at locations DESIGNATED ON THE GROUND. The work includes backfilling and construction of catch basins and headwalls.

MATERIALS

921.02
Requirements

Materials shall meet the requirements of the following sections:

961-Stone and Rock
963-Drainage Pipe

CONSTRUCTION

921.03
Culverts

Culverts shall be installed in accordance with Form FS-7700-76 and as follows:

(a) Bedding. The pipe shall be bedded in a stable foundation of undisturbed or compacted soil shaped to fit the lower quadrant of the pipe exterior. All unsuitable material encountered shall be removed to a minimum depth of 6 inches and to a minimum width of 1-1/2 pipe diameters and replaced with compacted mineral soil.

(b) Placing. Pipe-ditch relief culverts shall be skewed 45 degrees downgrade. Other culverts shall be placed in the natural streambed. All culverts shall be placed to provide for unobstructed inlet and outlet flow.

Helically corrugated lockseam pipe shall be installed with the seam at the inlet end placed below the horizontal centerline. Longitudinal laps on riveted or spot welded pipe shall be positioned at any location between 45 degrees above or below horizontal.

Logs, debris, soil, rock, or other obstructions below the pipe outlet that will impede flow away from the trailway shall be removed.

(c) Backfilling. Backfill material shall be compacted mineral soil.

(d) Headwalls. A headwall shall be constructed at the inlet and outlet end of the pipe in accordance with Form FS-7710-76. In all locations except in a turnpike section, the headwall shall extend from streambank to streambank and shall be horizontal on top.

921.04
Rock Culverts

Rock culverts shall be installed in accordance with Form FS-7700-77 and as follows:

(a) An excavation shall be made to expose a firm foundation. The bottom of the rock culvert shall be the natural streambed, improved by removal of rocks that would impede the flow of water. A catch basin will be formed to facilitate flow from a trail ditch into the culvert.

(b) Stones. Headwall stones shall be firmly embedded at least 6 inches below the natural streambed. Cover stones shall be long enough to bridge between outside faces of the headwalls. All stones shall be selected and placed so as to fit snugly and have firm bearing on underlying stones. Fill voids with rock spalls to prevent entry of soil into the drain.

(c) Backfilling. Backfill material shall be compacted mineral soil.

MEASUREMENT

921.05 Method The quantity to be paid for will be measured in accordance with Section 906.

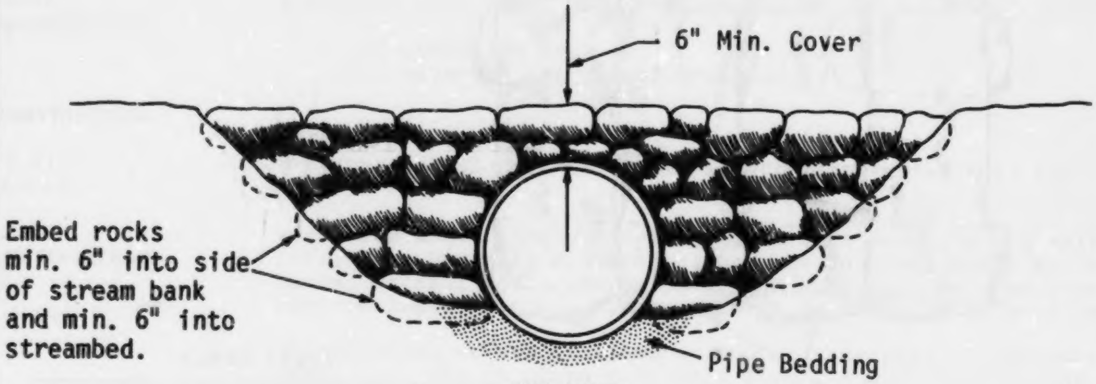
PAYMENT

921.06 Basis The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

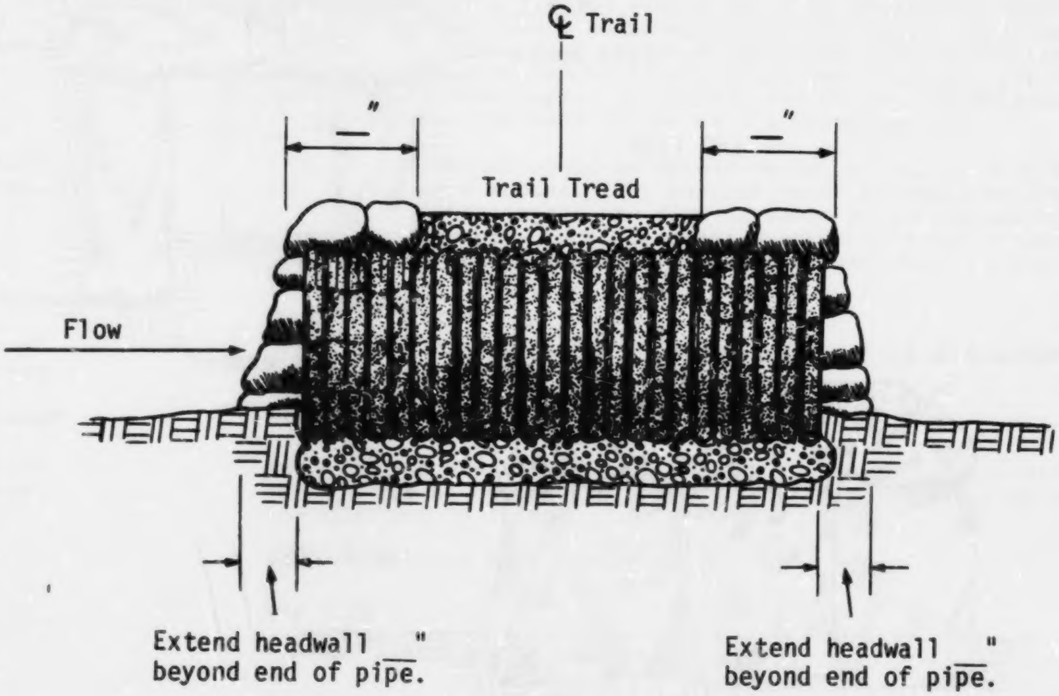
Payment will be made under:

Pay Item		Pay Unit
921(01)__	[--]" Corrugated [Type] Pipe - [--]" Thickness	L.F.
921(02)__	[--]" B.C.C. [Type] Pipe - [--]" Thickness	L.F.
921(03)__	[--]" [-----] End Section	L.F.
921(04)__	[--]" [Type] Underdrain	L.F.
921(05)	Rock Culverts	EA

Culvert


6" Min. Cover
Embed rocks min. 6" into side of stream bank and min. 6" into streambed.
Pipe Bedding

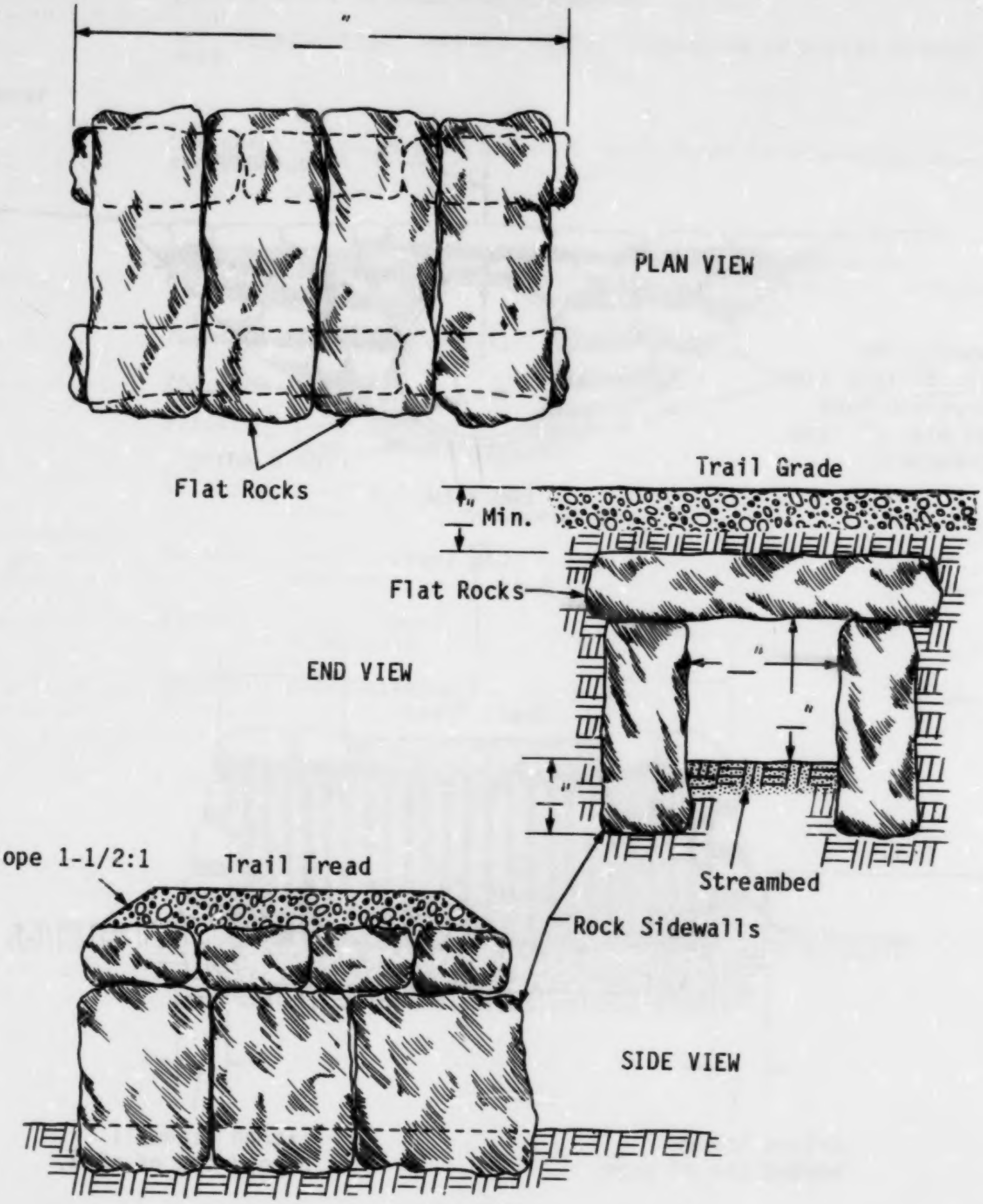
END VIEW


℄ Trail
__"
__"
Trail Tread
Flow
Extend headwall __" beyond end of pipe.
Extend headwall __" beyond end of pipe.

SIDE VIEW

921
.04

Rock Culvert



Section 922 - Waterbars

DESCRIPTION

922.01
Work

This work consists of installing waterbars in the trailbed at locations SHOWN ON THE DRAWINGS and DESIGNATED ON THE GROUND. Work shall include excavation, backfill, and construction of rock spillways.

MATERIALS

922.02
Requirements

Materials shall meet the requirements of the following sections:

961-Stone and Rock
962-Material for Timber Structures

CONSTRUCTION

922.03
General

Waterbars shall be constructed in accordance with Form FS-7700-78.

922.04
Rock Waterbar

Rocks shall be tightly overlapped and embedded into the existing trailbed. Backfill material around the waterbar shall be compacted mineral soil. The tops of the waterbar shall be even and have no sharp points. Minimum rock size shall be 2 cubic feet.

The outslope of the trailbed on the upgrade side of the waterbar shall be a smooth plane that will form a gutter against the waterbar.

922.05
Log or Treated
Timber Waterbars

A native log or a treated timber shall be completely embedded into the trailbed to form a waterbar across the trail. The top of the waterbar log shall be flush with the grade line of the trailbed on the downgrade side and be firmly compacted in place. In the absence of a backslope, the upgrade end of the log waterbar shall be anchored in the same manner as the downgrade end.

922.06
Surplus Material

Surplus excavation shall be spread below the trailbed at a depth not to exceed 4 inches. The surplus material shall be located so that it will not impede the flow of water away from the waterbar. Logs, debris, soil, rock, or other obstructions below waterbars that will impede flow away from the trailway shall be removed.

MEASUREMENT

922.07
Method

The quantity to be paid for will be measured in accordance with Section 906.

PAYMENT

922.08
Basis

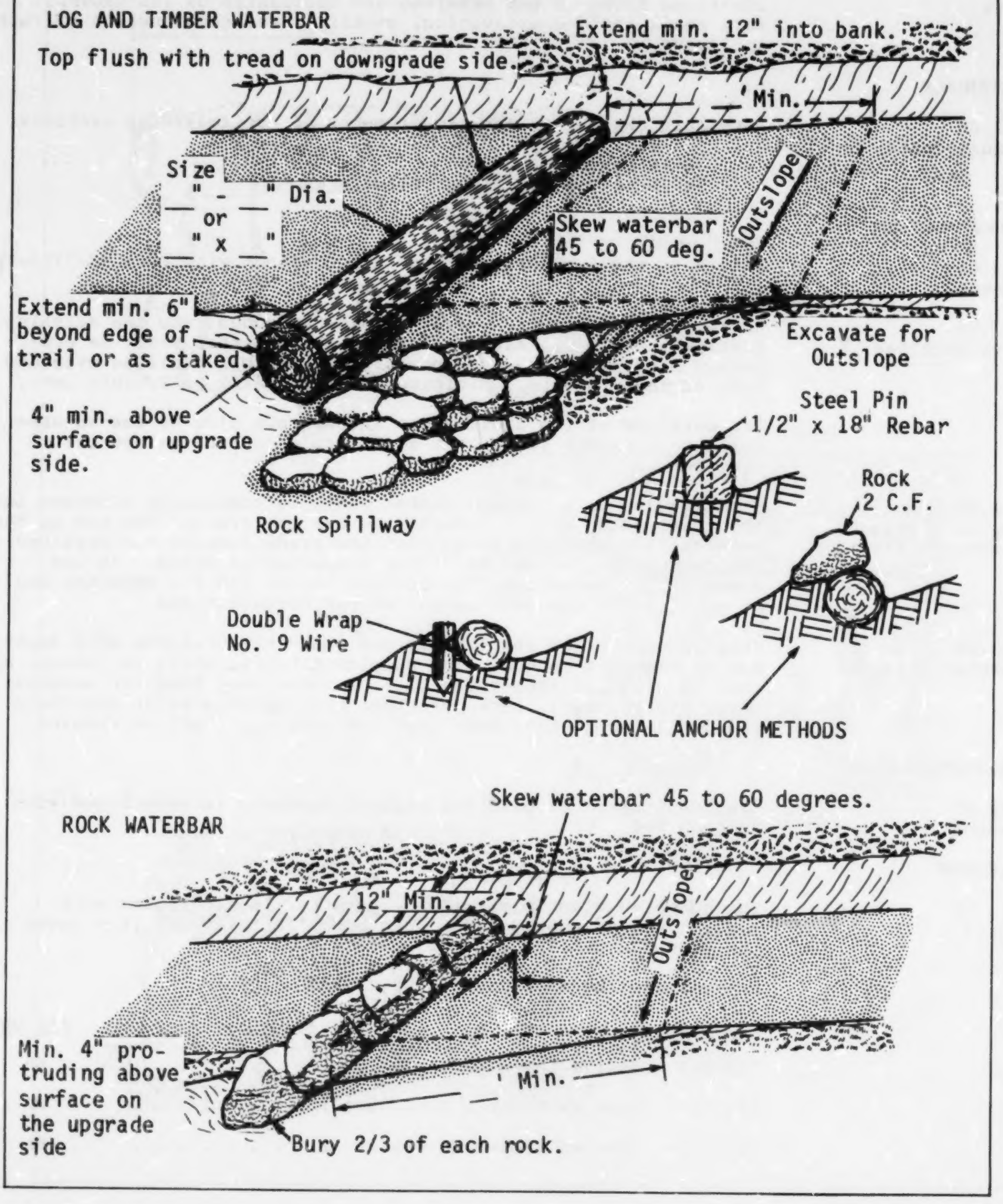
The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
922(01)	Native Log Waterbar	EA
922(02)	Rock Waterbar	EA
922(03)	Treated Timber Waterbar	EA

922
.08

Waterbar


LOG AND TIMBER WATERBAR
Top flush with tread on downgrade side.
Extend min. 12" into bank.
Min.
Size
___" - ___" Dia.
or
___" x ___"
Skew waterbar 45 to 60 deg.
Outslope
Extend min. 6" beyond edge of trail or as staked.
Excavate for Outslope
4" min. above surface on upgrade side.
Rock Spillway
Steel Pin 1/2" x 18" Rebar
Rock 2 C.F.
Double Wrap No. 9 Wire
OPTIONAL ANCHOR METHODS
ROCK WATERBAR
Skew waterbar 45 to 60 degrees.
12" Min.
Outslope
Min. 4" protruding above surface on the upgrade side
Min.
Bury 2/3 of each rock.

Section 923 - Rock Spillways

DESCRIPTION

923.01 Work

This work shall consist of constructing rock spillways at outlets of culverts, drainage dips, waterbars, open top drains, and other drainage structures. Work shall include selecting rock material, excavation of foundations, and placement of rock.

MATERIALS

923.02 Requirements

Materials shall meet the requirements of the following section:

961-Stone and Rock

Rock shall be between 1/4 and 1 cubic foot in size.

CONSTRUCTION

923.03 General

Rock spillways shall be constructed in accordance with Form FS-7700-79.

923.04 Excavation

A horizontal bench shall be excavated into undisturbed material as a foundation for the rock spillway.

923.05 Rock Placement

The spillway shall be constructed by hand-placing rock, with the larger rock at the bottom of the spillway. Rock shall be placed to interlock with adjacent rocks and be securely bedded. Spalls shall be used to fill voids.

MEASUREMENT

923.06 Method

The quantity to be paid for will be measured in accordance with Section 906.

PAYMENT

923.07 Basis

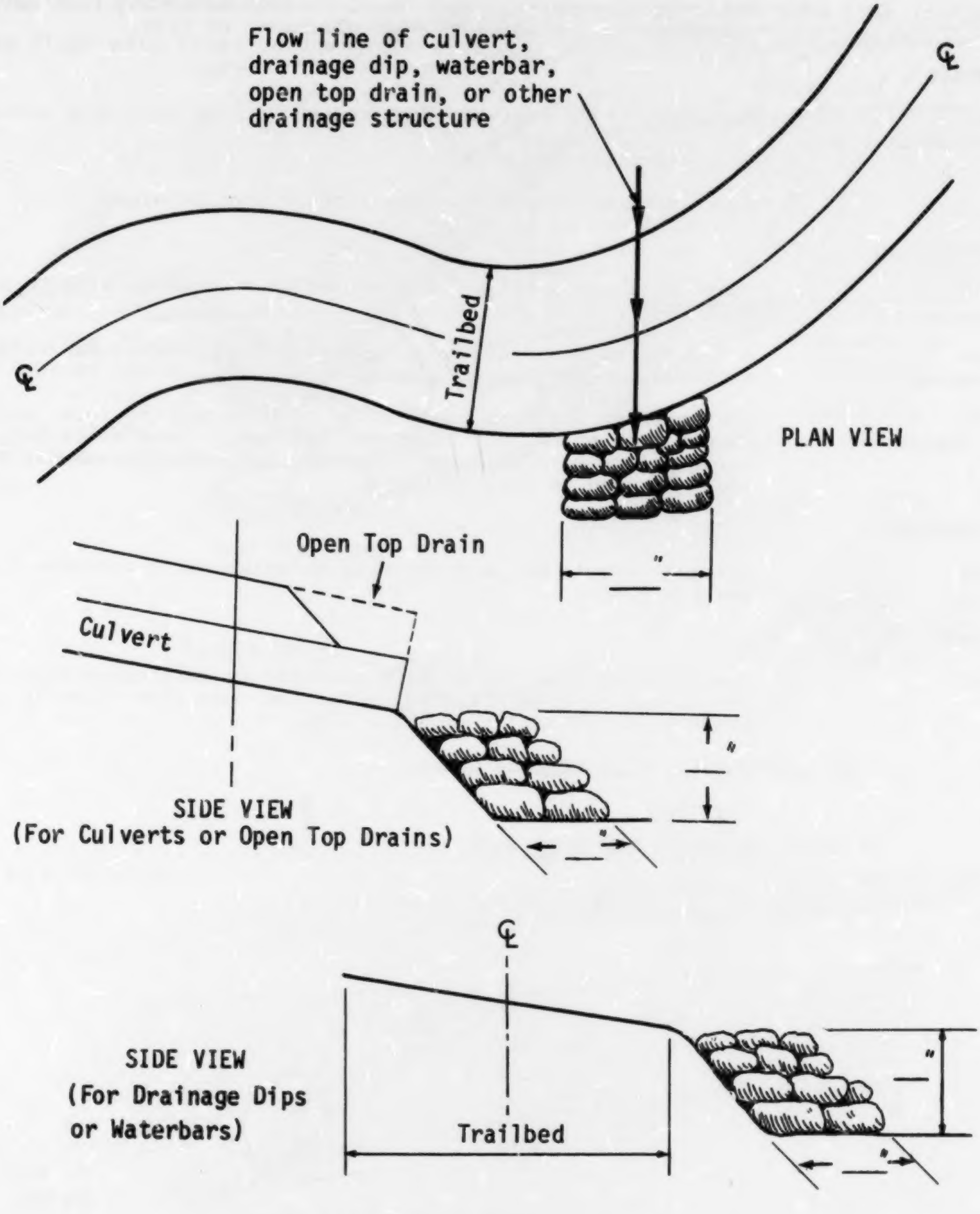
The accepted quantity will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
923(01)	Rock Spillway	EA

923
.07

Rock Spillway



Section 924 - Rock Underdrain

DESCRIPTION

924.01
Work

This work consists of constructing an underdrain adjacent to and under the trail and ditches at locations SHOWN ON THE DRAWINGS and DESIGNATED ON THE GROUND.

MATERIALS

924.02
Requirements

Materials shall meet the requirements of the following sections:

961-Stone and Rock
964-Geotextiles

Filter rock must be clean and shall not be larger than 4 inches or smaller than 1 inch in diameter.

CONSTRUCTION

924.03
Trench Construction

Trenches shall be excavated to the dimensions SHOWN ON FORM FS-7700-80. Trenches for the underdrain shall be graded to provide complete drainage of the underdrain system. The drain field trenches shall be approved by the Engineer in writing before placing filter rock.

924.04
Filter Construction

When shown in the SCHEDULE OF ITEMS, fabric shall be placed in the trench in accordance with Form FS-7700-80.

If fabric is not required, untreated building paper shall be placed over the filter rock before backfilling the trench to finish grade.

Excess and unsuitable materials shall be spread below the trailway to a depth not to exceed 4 inches.

924.05
Ditches

Ditches will be constructed in accordance with Form FS-7700-80.

MEASUREMENT

924.06
Method

The quantity to be paid for will be measured in accordance with Section 906.

The following will be considered incidental to other pay items and extra payment will not be given:

(a) Filter Rock.

(b) Untreated Building Paper.

(c) Native Material Seal.

PAYMENT

924.07
Basis

The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

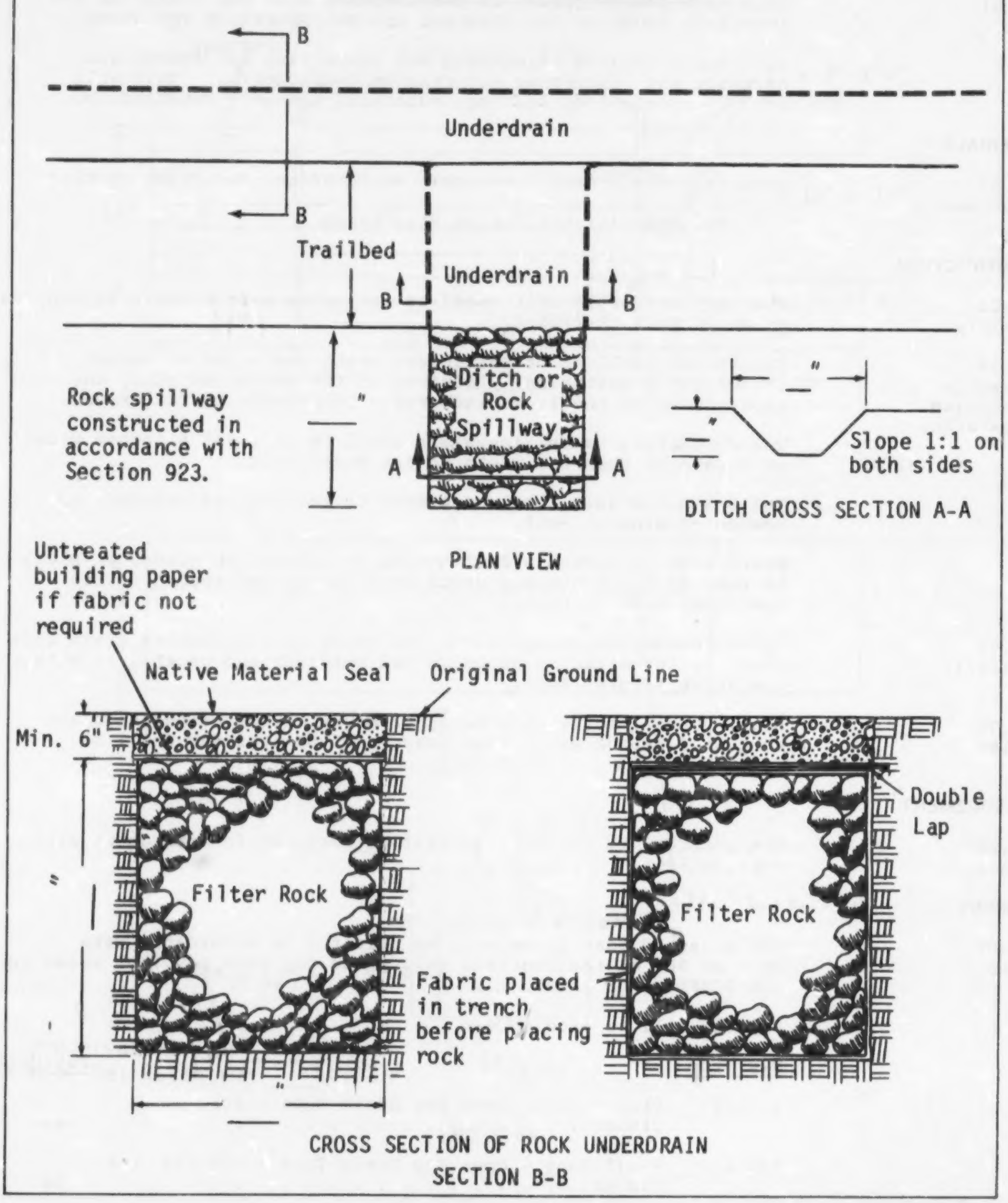
Payment will be made under:

Pay Item		Pay Unit
924(01)	Rock Underdrain	L.F.
924(02)	Woven Fabric	S.Y.
924(03)	Nonwoven Fabric	S.Y.

924
.07

Pay Item		Pay Unit
924(04)	Ditch	L.F.
924(05)	Rock Spillway	EA

Rock Underdrain Installations



Section 925 - Open Top Drains

DESCRIPTION

925.01 Work

This work shall consist of constructing open top drains at the locations SHOWN ON THE DRAWINGS and DESIGNATED ON THE GROUND.

Work shall include furnishing and installing all lumber and hardware and performing all related construction. This will include excavation, bedding, backfill, and berm construction.

MATERIALS

925.02 Requirements

Materials shall meet the requirements of the following section:

962-Material for Timber Structures

CONSTRUCTION

925.03 Assembly

The complete drain unit shall be assembled before installation, as SHOWN ON FORM FS-7700-82.

925.04 Excavation & Foundation Preparation

Excavation shall be of sufficient depth and width to permit foundation preparation, placement of the assembled unit, and backfilling to the lines and grades DESIGNATED ON THE GROUND.

The foundation excavation width shall be at least 6 inches wider on each side than the width of the drain unit.

The assembled unit shall be placed on stable, undisturbed, or compacted mineral soil.

Where rock or unstable soil occurs at foundation grade, it shall be removed for a minimum depth of 6 inches and replaced with compacted mineral soil.

925.05 Backfill

After foundation preparation, the completely assembled drain unit shall be installed as SHOWN ON THE DRAWINGS and backfilled with compacted mineral soil.

925.06 Outlet

Logs, debris, soil, rock or other obstructions below the drain that will impede water flow away from the trailway shall be removed.

MEASUREMENT

925.07 Method

The quantity to be paid for will be measured in accordance with Section 906.

PAYMENT

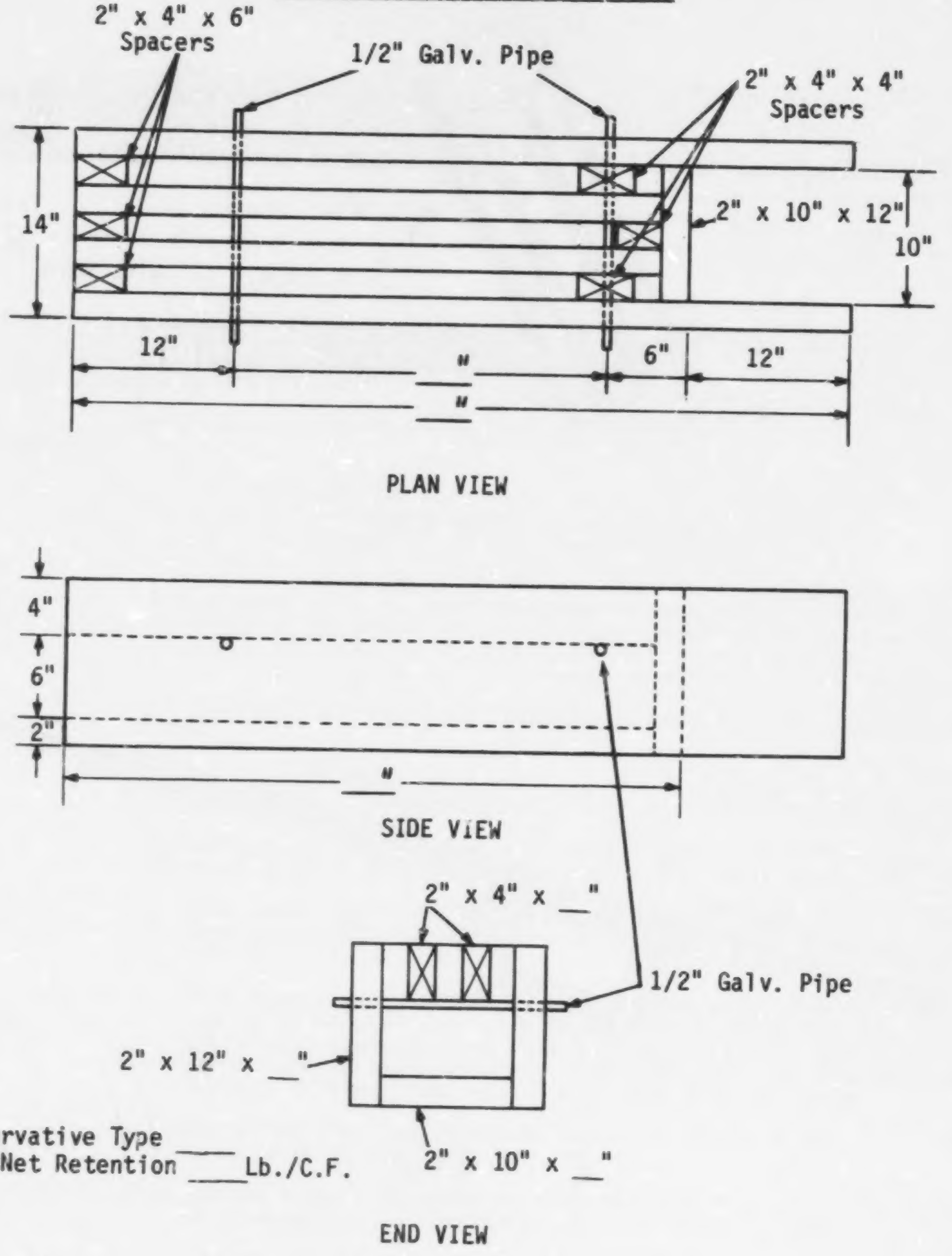
925.08 Basis

The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
925(01)__	[--]" long - Open Top Drain Type - Str. Timber	EA
925(02)__	[--]" long - Open Top Drain Type - Treated Timber	EA

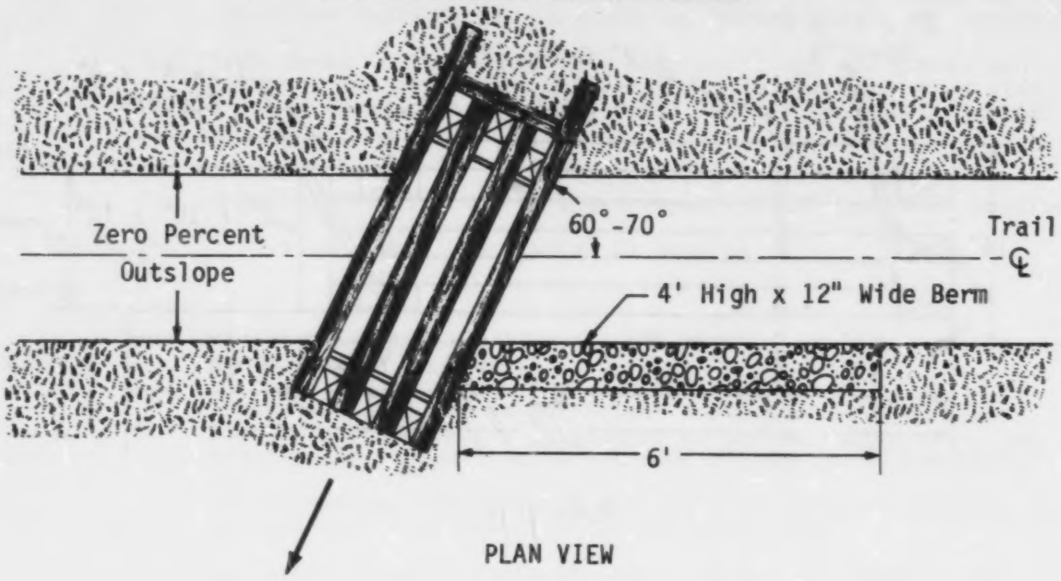
Fabrication of Open-Top Drain



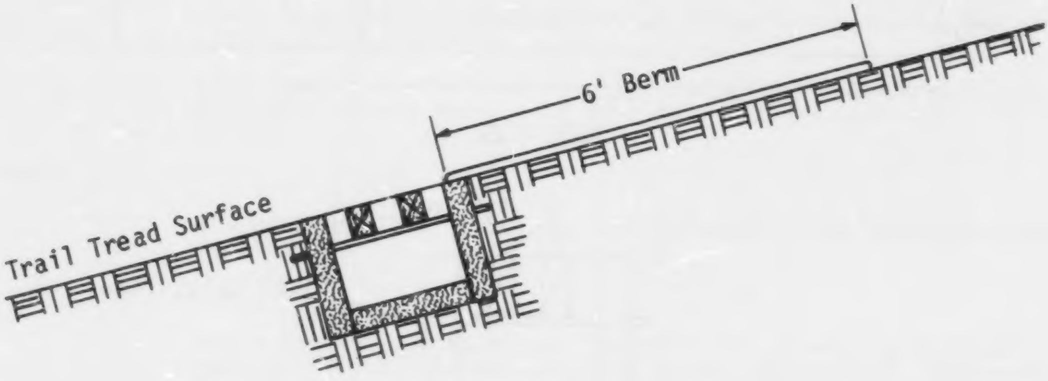
Preservative Type ____
Min. Net Retention ____ Lb./C.F.

925
.08

Installation of Open-Top Drain



PLAN VIEW



PROFILE

Section 931 - Log Stringer Bridge

DESCRIPTION

931.01 Work

This work shall consist of the construction of log stringer bridges, with plank or log decks and handrails.

MATERIALS

931.02 Native Timber

The location of trees for native timber materials will be SHOWN ON THE DRAWINGS and DESIGNATED ON THE GROUND. Materials shall be of the species and size SHOWN ON FORM FS-7700-83 and shall meet the requirements of the following section:

962-Material for Timber Structures

CONSTRUCTION

931.03 General

Bridges shall be constructed in accordance with Forms FS-7700-83 through FS-7700-86. Spike holes shall be predrilled when necessary to prevent splitting. Spikes shall be driven flush.

931.04 Mud Sills

Mud sills shall form the foundation for the bridge and be secured in place at the staked position at each end of the span. Ground shall be excavated and leveled for placement of the mud sills. Mud sills shall be buried to the depth necessary for the bottom of the log stringers to just clear the natural ground surface.

931.05 Stringers

Each stringer shall be attached to each sill with drift pins.

931.06 Decking

The decking shall be of the type SHOWN ON FORM FS-7700-83. Decking shall be laid evenly at right angles and spiked to each stringer.

Split log decking shall be laid alternately flat side down first, then round side down, ending with a flat side down.

Protruding ends of the decking shall be trimmed to give a straight-line appearance to the edges of the structure, except for decking providing handrail support.

931.07 Curb Logs

Curb logs shall be pinned to the stringers with drift pins. Spacing of drift pins shall be as SHOWN ON FORM FS-7700-85. On structures with spans of less than 20 feet, the curb logs shall be one piece. On longer spans, the curb logs shall be not less than 10 feet in length and shall be joined by a lap joint.

931.08 Run Plank

Run plank shall be provided when SHOWN ON FORM FS-7700-83 and be in accordance with Form FS-7700-86.

931.09 Handrail

Handrail shall be provided when SHOWN ON FORM FS-7700-83 and shall be constructed in accordance with Form FS-7700-86.

931.10 Bulkhead

At each end of the structure, a plank or slab shall be spiked to the ends of the stringers in accordance with Form FS-7700-84.

931.11 Approach Fills

The approach fills shall be constructed with compacted mineral soil and rock.

MEASUREMENT

931.12 Method — The quantity to be paid for will be measured in accordance with Section 906. Unless listed in the SCHEDULE OF ITEMS, approach fills will be considered incidental to other pay items.

PAYMENT

931.13 Basis — The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
931(01)__	Log Stringer Bridge - Span length [-]'	EA
931(02)	Log Stringer Bridges	L.S.
931(03)	Log Stringer Bridge	L.F.
931(04)	Approach Fills	L.F.

USDA - Forest Service

Log Stringer Bridge Species & Dimensions

Function	Species	Length	Size	Number Required
Mud Sill				
Stringer				
Curb Log		Min.		
Run Plank		Min.	Ea.	
Handrail Post			3" - 4"	
Handrail		Min.	3" - 4"	
Bulkhead				
Brace (A)				
Brace (B)				

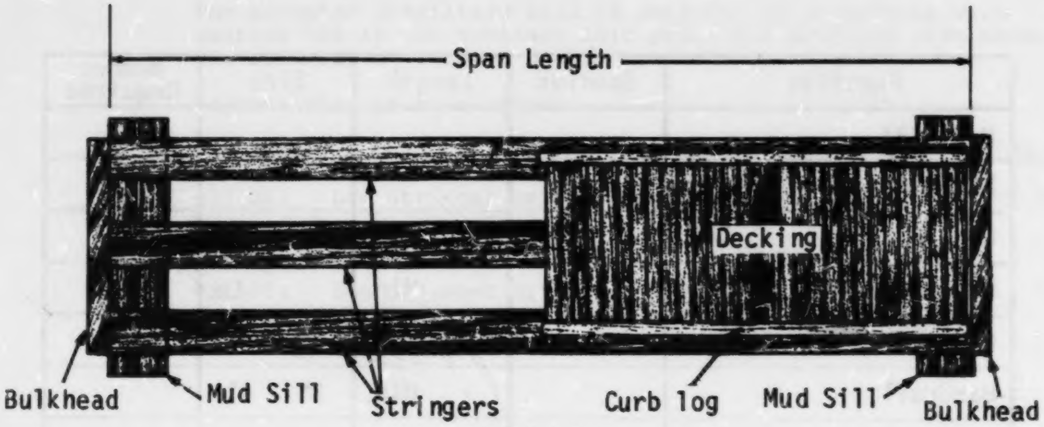
Decking	Species	Size
Rough Mill Sawn		
Rough Mill Sawn,Treated		
Split Plank or Field Sawn		
Round Log		
Split Log		

Preservative Type ____
Min. Net Retention ____ Lb./C.F.

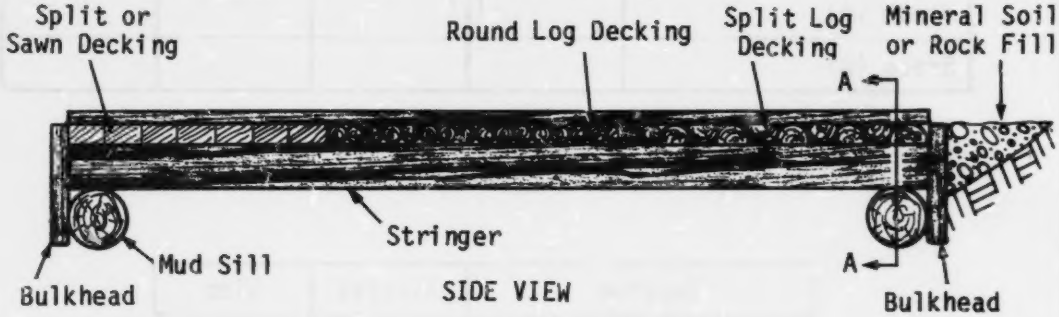
FS-7700-83 (6/84)

931
.13

Log Stringer Bridge Typical Sections

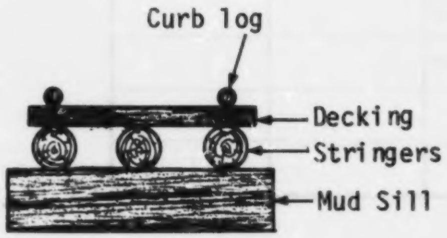


PLAN VIEW

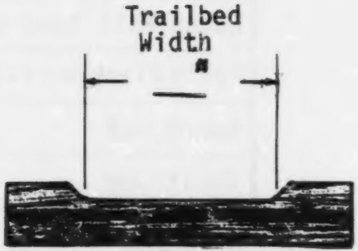


SIDE VIEW

931
.13



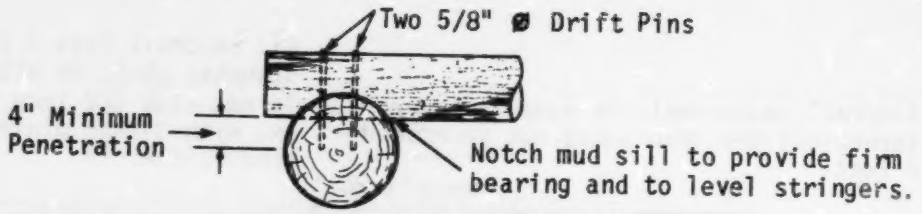
SECTION A-A



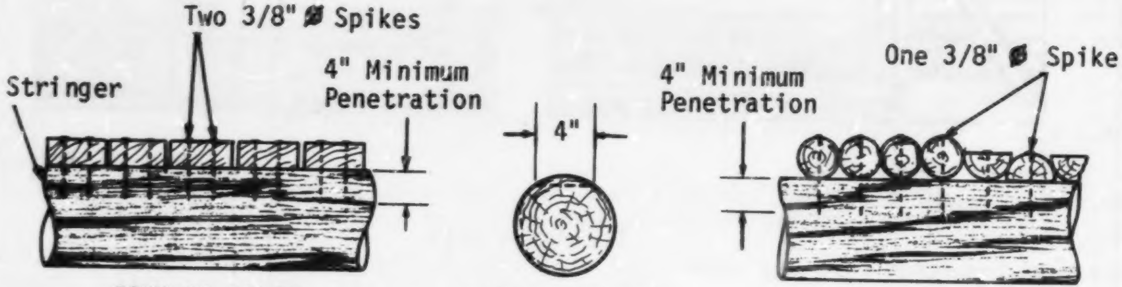
Hew round logs or round portion of split logs to provide flat surface for trail tread.

TRAIL TREAD DETAIL

Log Stringer Bridge Construction Details


Two 5/8" Ø Drift Pins
4" Minimum Penetration
Notch mud sill to provide firm bearing and to level stringers.

CONNECTION OF MUD SILL AND STRINGER

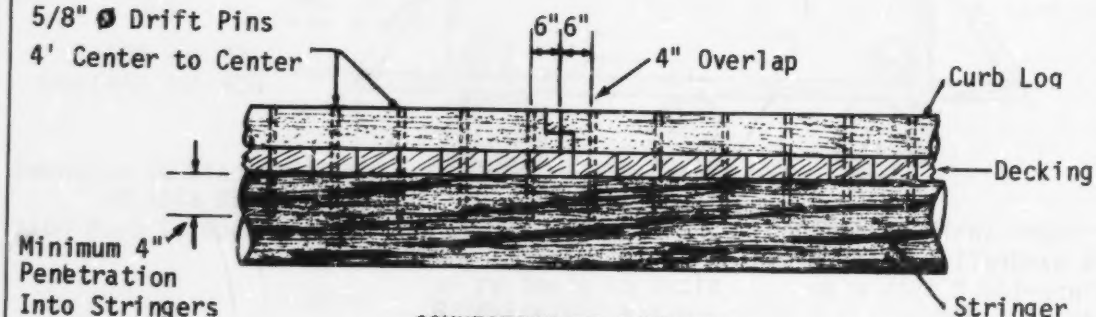


SAWN OR SPLIT PLANK DECKING

FACE STRINGERS FOR DECKING

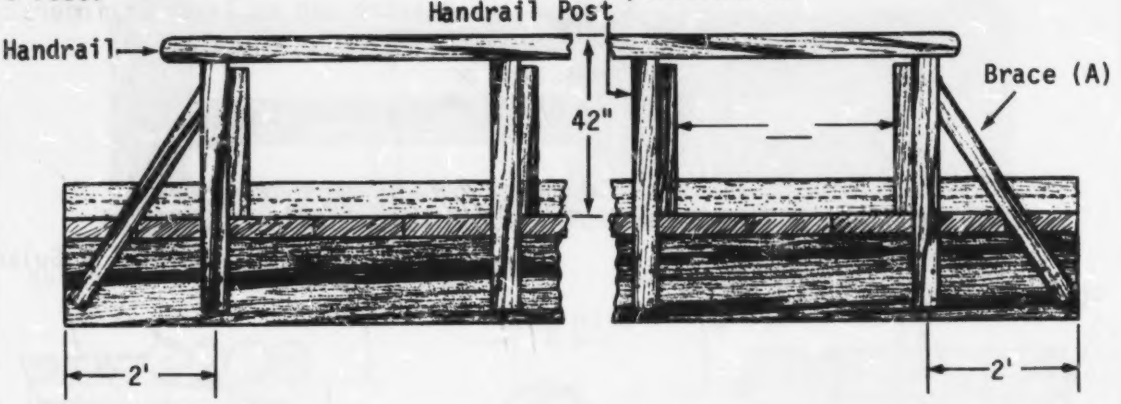
ROUND OR SPLIT LOG DECKING

CONNECTION OF DECKING TO STRINGERS



CONNECTION OF CURB LOG TO STRINGER

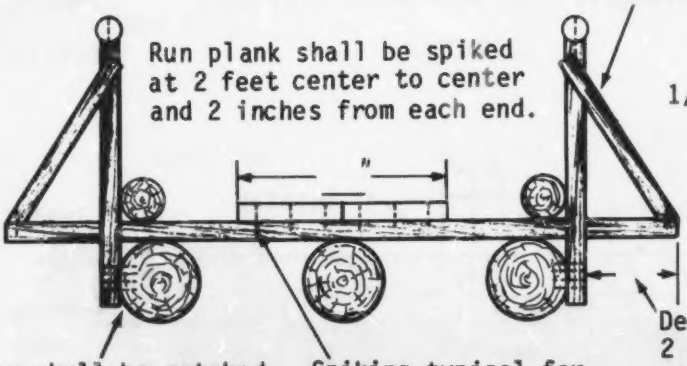
Log Stringer Bridge Handrail & Running Plank



Handrail posts shall be equally spaced throughout the span so as not to exceed 8 feet.

All handrail logs 3 to 4 inches in diameter shall be attached at joints with 3/8-inch 0 spikes and with 3-inch minimum penetration.

ELEVATION VIEW



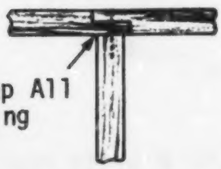
Run plank shall be spiked at 2 feet center to center and 2 inches from each end.

Stringer shall be notched and handrail log patterned to provide 2 inch wide bearing surface.

Spiking typical for 3" x 12" plank. Other sizes of plank to be similar. Use 3/8" 0 spikes.

Decking shall be extended 2 feet each side to attach brace at each post.

END VIEW



SPLICE DETAIL FOR TOP HANDRAIL

931
.13

Section 932 - Foot-Log Bridge

DESCRIPTION

932.01
Work

This work shall consist of the construction of foot-log bridges and handrails.

MATERIALS

932.02
Requirements

The location of trees for native timber materials will be SHOWN ON THE DRAWINGS and DESIGNATED ON THE GROUND. Materials shall be the species and size SHOWN ON FORM FS-7700-87 and meet the requirements of the following section:

962-Material for Timber Structures

CONSTRUCTION

932.03
General

Native timber material shall be notched, and faced as SHOWN ON FORM FS-7700-87. Attached members shall not be split or loose.

932.04
Mud Sills

Mud sills shall form the foundation and be secured in place at the staked position at each end of the span. The ground shall be excavated and leveled for placement of the mud sills. Each mud sill shall be hewn to provide level bearing surface for the foot-log.

932.05
Foot-Log &
Handrails

The bottom of the foot-log shall be hewn to provide a firm bearing with the mud sill.

When SHOWN ON THE SCHEDULE OF ITEMS, handrails shall be installed on the foot-log bridge as SHOWN ON FORM FS-7700-87.

932.06
Approach Fills

The approach fills shall be constructed with compacted mineral soil and rock.

MEASUREMENT

932.07
Method

The quantity to be paid for will be measured in accordance with Section 906. Unless listed in the SCHEDULE OF ITEMS, approach fills will be considered incidental to other pay items.

PAYMENT

932.08
Basis

The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

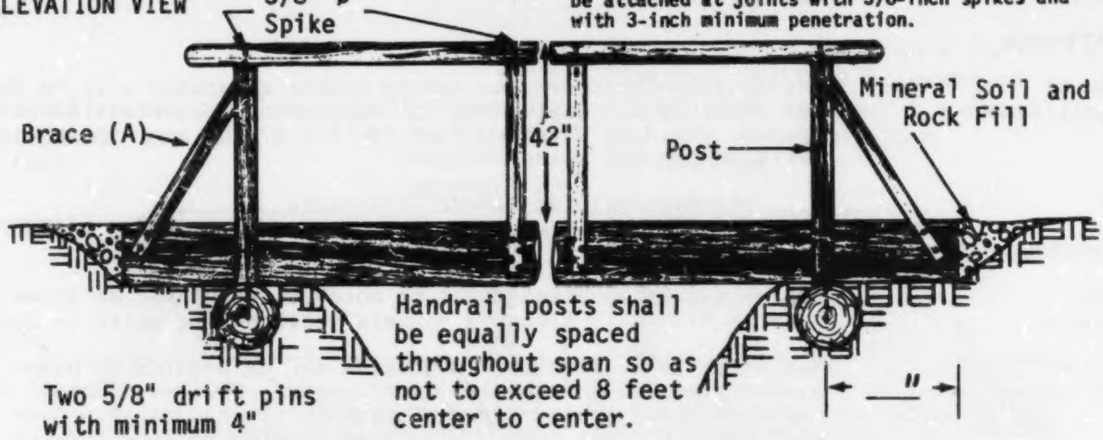
Payment will be made under:

Pay Item		Pay Unit
932(01)__	Foot-Log Bridge [-]' long	EA
932(02)	Foot-Log Bridge	L.S.
932(03)	Foot-Log Bridge	L.F.
932(04)__	Foot-Log Bridge [-]' long with Handrail	EA
932(05)	Foot-Log Bridge with Handrail	L.S.
932(06)	Foot-Log Bridge with Handrail	L.F.
932(07)	Approach Fill	L.F.

Foot-Log Bridge

All handrail logs 3 to 4 inches in diameter shall be attached at joints with 3/8-inch spikes and with 3-inch minimum penetration.

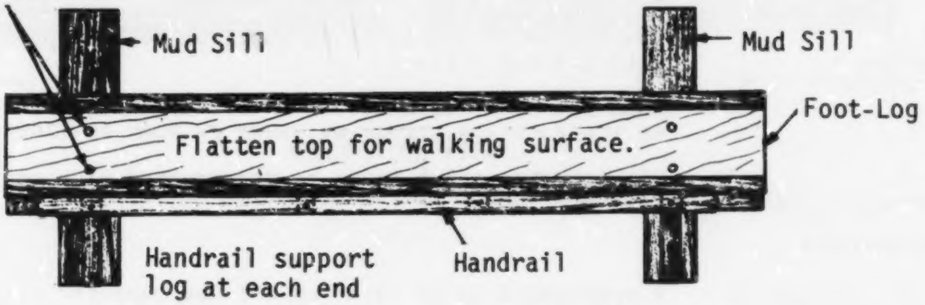
ELEVATION VIEW



Handrail posts shall be equally spaced throughout span so as not to exceed 8 feet center to center.

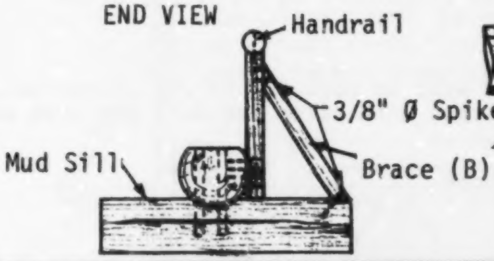
Two 5/8" drift pins with minimum 4" penetration

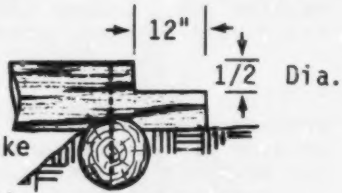
PLAN VIEW



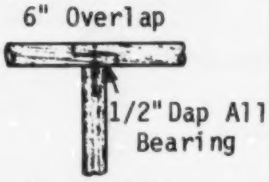
Handrail support log at each end

END VIEW



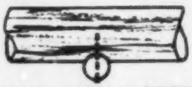


NOTCH FOR STEP
If foot-log larger than 12" diameter.

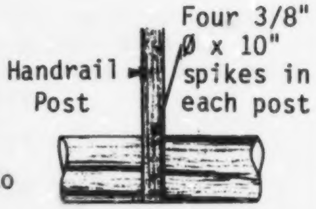


SPLICE DETAIL
FOR TOP HANDRAIL

Function	Species	Size	Length
Mud Sill			
Foot-Log			
Handrails		3" to 4" Ø	
Posts			
Brace (A)			
Brace (B)			



FOOT-LOG NOTCH
Notch foot-log to provide bearing for post and braces.



HANDRAIL POST
DETAIL

932
.08

Section 933 - Trail Puncheon Bridges

DESCRIPTION

933.01
Work

This work shall consist of construction of puncheon bridges, supported by log stringers and sills at locations SHOWN ON THE DRAWINGS and DESIGNATED ON THE GROUND. It shall include furnishing and installing all hardware, lumber, timbers, and logs.

MATERIALS

933.02
Requirements

Materials shall meet the requirements of the following section:

962-Material for Timber Structures

CONSTRUCTION

933.03
General

Puncheon bridges shall be constructed in accordance with Form FS-7700-88.

Spike holes shall be predrilled when necessary to prevent splitting. Spikes shall be driven flush.

933.04
Mud Sills

Mud sills shall be buried to a depth whereby the combined height of stringers and decking is even with the trail grade. Mud sills shall be completely covered when practical. Mud sills shall be level and shall be notched to level the stringers.

933.05
Stringers

Stringers shall be cut not less than 12 feet in length and arranged in pairs of the same length and diameter. The stringers shall be pinned to the mud sills with 2 each 3/8-inch drift pins on each end. The drift pins shall have a minimum penetration of 4 inches into the mud sill.

Stringers shall be hewn to provide a 2-inch wide bearing surface for the decking.

933.06
Decking

Split-log decking shall be laid alternately with flat side down first, then round side down, ending with flat side down. When the round side is down, it shall be hewn to provide a 2-inch bearing surface. Each log shall be spiked to the stringer with a 3/8-inch diameter spike on each end.

Round-log decking shall be hewn to provide a 2-inch flat bearing surface on the stringer. Each log shall be spiked to the stringer with a 3/8-inch diameter spike on each end.

Split and sawn decking planks shall be laid on the stringers to provide bearing for the full width of the plank. Each piece of plank decking shall be spiked with two 3/8-inch diameter spikes at each end. Spikes shall penetrate stringers a minimum of 4 inches. Decking shall be laid or trimmed to give a straight line appearance to the edges of the structure.

933.07
Curb Logs

Logs shall be placed on top of the decking directly over the stringers. The logs shall be pinned with 3/8-inch steel drift pins. The drift pins shall be long enough to provide a minimum penetration of 4 inches into the stringers. The curb logs shall not be less than 10 feet in length unless the structure is less than 10 feet in length.

933.08
Bulkhead

At each end of the structure, a slab or plank, sufficiently wide to fill the space between the top of the deck and the bottom of the stringers, shall be set on edge and spiked securely to the ends of the stringers.

933.09
Approach Fill

The approach fills shall be constructed with compacted mineral soil and rock.

MEASUREMENT

933.10
Method

The quantity paid for will be measured in accordance with Section 906. Approach fills will be considered incidental to other pay items and extra payment will not be given.

PAYMENT

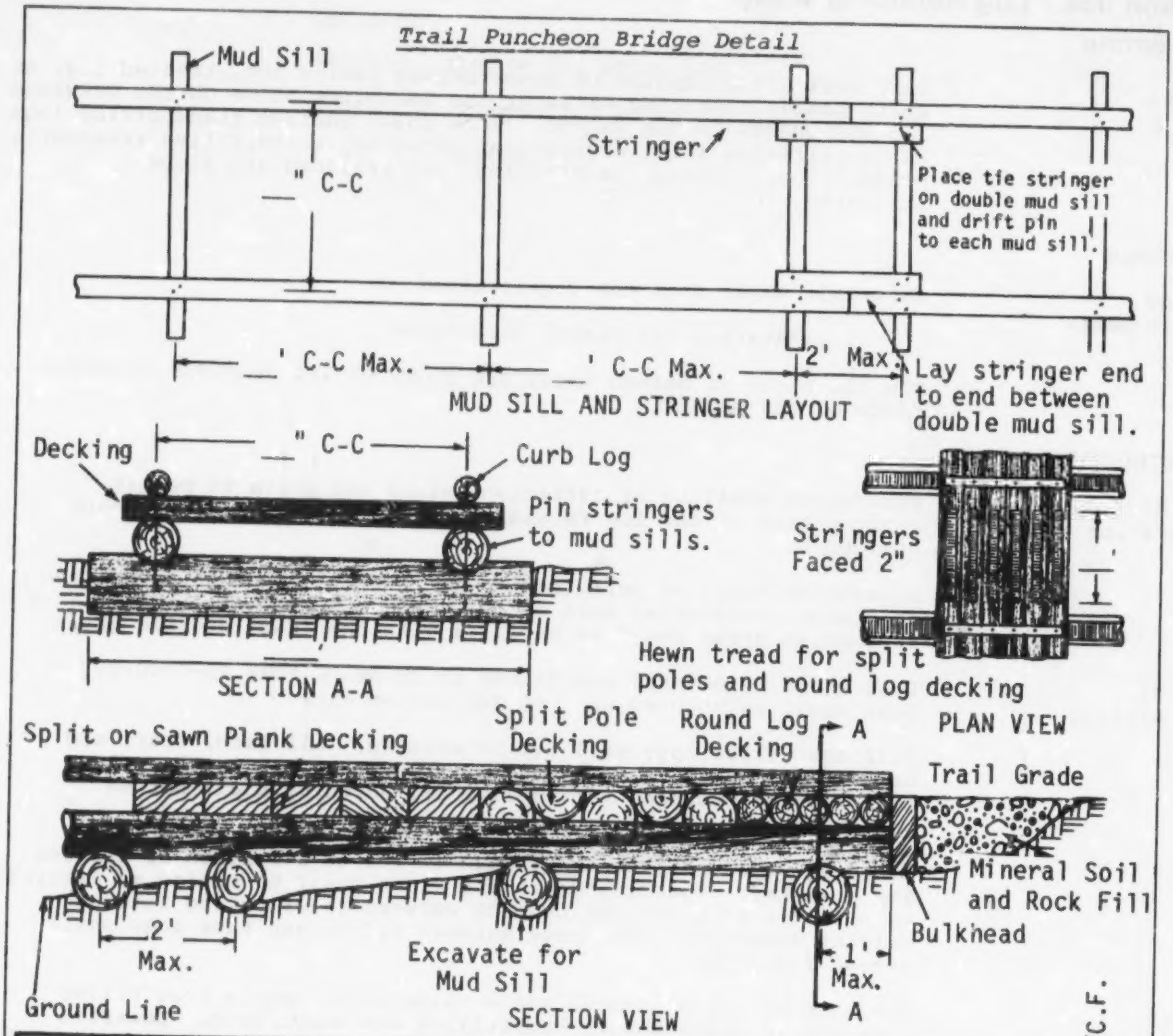
933.11
Basis

The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
933(01)	Puncheon Bridge Span Length [-]'	EA
933(02)	Puncheon Bridge	L.S.
933(03)	Trail Puncheon Bridge	L.F.
933(04)	Approach Fill	L.F.

Trail Puncheon Bridge Detail


Mud Sill
Stringer
" C-C
Place tie stringer on double mud sill and drift pin to each mud sill.
' C-C Max.
' C-C Max.
2' Max
Lay stringer end to end between double mud sill.
MUD SILL AND STRINGER LAYOUT
Decking
" C-C
Curb Log
Pin stringers to mud sills.
Stringers Faced 2"
Hewn tread for split poles and round log decking
SECTION A-A
PLAN VIEW
Split or Sawn Plank Decking
Split Pole Decking
Round Log Decking
A
Trail Grade
Mineral Soil and Rock Fill
Bulkhead
2' Max.
Excavate for Mud Sill
1' Max.
A
Ground Line
SECTION VIEW

Function of Log	Species	Diameter	Length
Mud Sill			
Log Stringer			
Curb Log			
Bulkhead			
Type of Decking	Species	Size	Length
Rough Mill Sawn, Treated			
Rough Mill Sawn			
Split Plank or Field Sawn			
Round Log			
Split Pole			

Preservation Type ___

Min. Net Retention ___ Lb./C.F.

Section 934 - Log Retaining Walls

DESCRIPTION

934.01
Work

This work shall consist of constructing native log, treated log, or split timber retaining walls at the locations SHOWN ON THE DRAWINGS and DESIGNATED ON THE GROUND. Work shall include transporting logs to installation site, excavation, notching, preservative treatment, predrilling, pinning, backfilling, and trailbed and slope finishing.

MATERIALS

934.02
Requirements

Materials shall meet the requirements of:

962-Material for Timber Structures

The locations of marked trees are SHOWN ON THE DRAWINGS or DESIGNATED ON THE GROUND.

CONSTRUCTION

934.03
Excavation

Excavation shall be of sufficient width and depth to permit construction of the log retaining wall in accordance with Form FS-7700-89.

Excavation shall be performed to provide a full bench foundation of stable undisturbed soil or compacted mineral soil. The finish foundation grade shall be parallel with the trail profile grade.

934.04
Log Fitting

Logs shall be notched and fitted as SHOWN ON FORM FS-7700-89. Logs shall be notched only on the bottom side.

Sill and filler logs will not be notched. All face, rear, and header logs shall be individually notched to fit as the wall construction proceeds vertically; pre-notching shall not be permitted.

Notching depth shall be a minimum of 1/4 to a maximum of 1/3 the log diameter. Notching depth and width shall be varied as required to obtain a snug fit and contact between interlocking logs of varying diameters. No space between filler and face logs shall exceed 1/2 inch.

934.05
Backfill

Sequence of log placement and pinning shall ensure that filler logs are in place before backfilling and compaction. Backfill material shall contain rock no larger than 4 inches in the largest dimension.

MEASUREMENT

934.06
Method

The quantity to be paid for will be measured in accordance with Section 906.

Unless listed in the SCHEDULE OF ITEMS, borrow will be considered incidental to other pay items.

PAYMENT

934.07
Basis

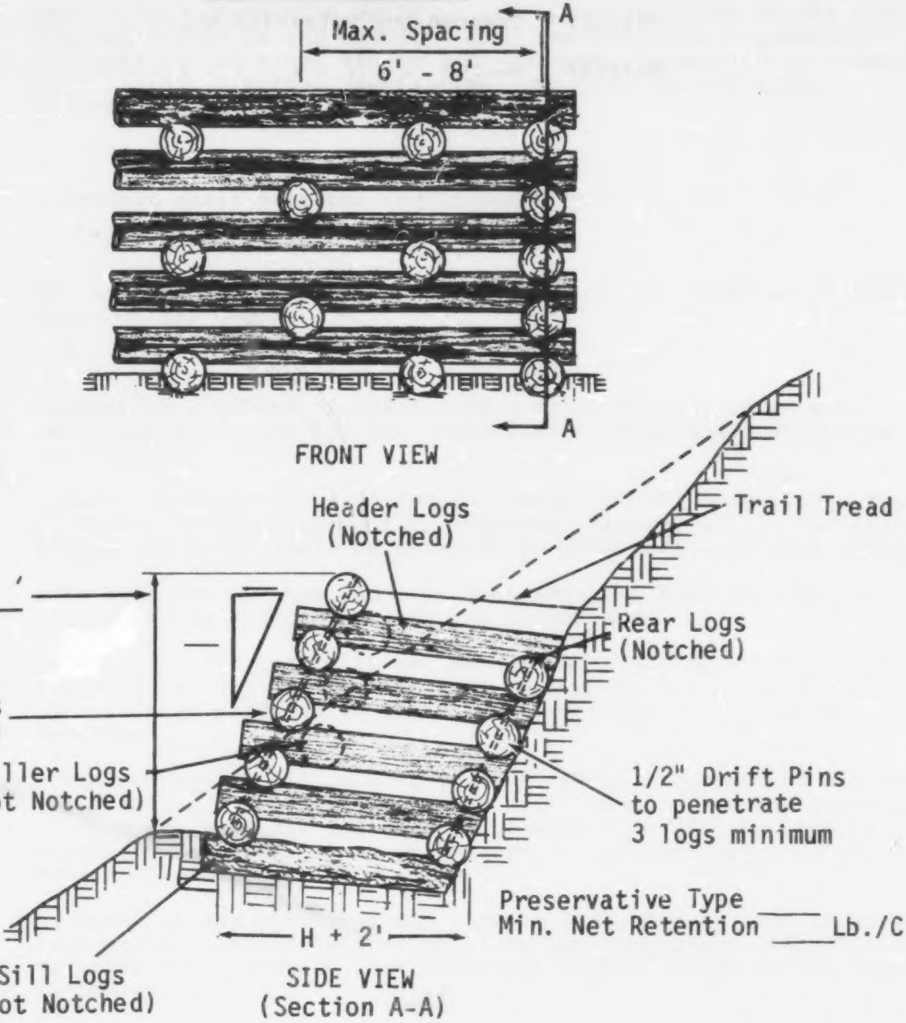
The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
934(01)	Native Log Retaining Wall	S.F.
934(02)	Treated Log Retaining Wall	S.F.
934(03)	Borrow	C.Y.

934
.07

Log Retaining Wall



Preservative Type ____
Min. Net Retention ____ Lb./C.F.

Log	Species	Length		Size (In.)
		Min.(Ft.)	Max.(Ft.)	
Sill Logs				
Filler Logs				
Header Logs				
Rear Logs				
Face Logs				

Straightness Requirements: The true center line of each log shall deviate no more than __ inches from a straight line between the centers of the ends of the log.

Section 935 - Rock Retaining Walls

DESCRIPTION

935.01
Work

This work shall consist of constructing native rock retaining walls at the locations SHOWN ON THE DRAWINGS and DESIGNATED ON THE GROUND. Work shall include transporting rocks to installation site, excavation, placing, backfilling, and trailbed and slope finishing.

MATERIALS

935.02
Requirements

Materials shall meet the requirements of the following section:

961-Stone and Rock

All rock shall be of a general rectangular shape, and at least 50 percent of all rocks in a completed wall shall be 1 cubic foot or greater in size.

Small stones, rock fragments, and fine aggregate shall be used to fill voids.

CONSTRUCTION

935.03
Excavation

Excavation shall be of sufficient width and depth to permit construction of the rock retaining wall in accordance with Form FS-7700-90. Excavation shall be performed to provide a full-bench foundation for the wall. The foundation shall consist of stable undisturbed soil or compacted mineral soil.

935.04
Wall Construction

Vertical joints shall be staggered a minimum of 4 inches horizontally from any vertical joint in an adjoining course.

At least 25 percent of the rocks in the front and rear faces of the wall shall be uniformly distributed header stones, each having a length at least 2-1/2 times its width. All header stones shall be laid with greatest dimension extending into the wall (at right angle to trail centerline), except at corners. At corners, alternating courses shall contain headers laid with greatest dimension parallel with wall.

The exposed face of each rock shall be parallel to the face of the wall in which it is set.

Each rock placed shall be stable on the course that supports it and shall be so handled as to not break, jar, or displace rocks already set.

Large rocks shall be used in the bottom course. Voids shall be filled with small stones, rock fragments, or fine aggregate.

MEASUREMENT

935.05
Method

The quantity to be paid for will be measured in accordance with Section 906.

PAYMENT

935.06
Basis

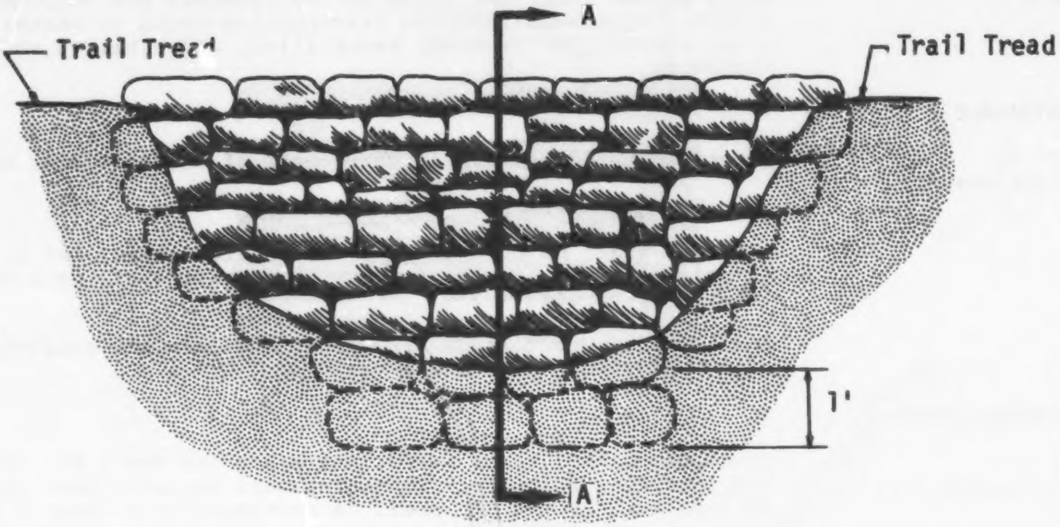
The accepted quantity will be paid for in accordance with Section 906 at the contract unit price for the pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

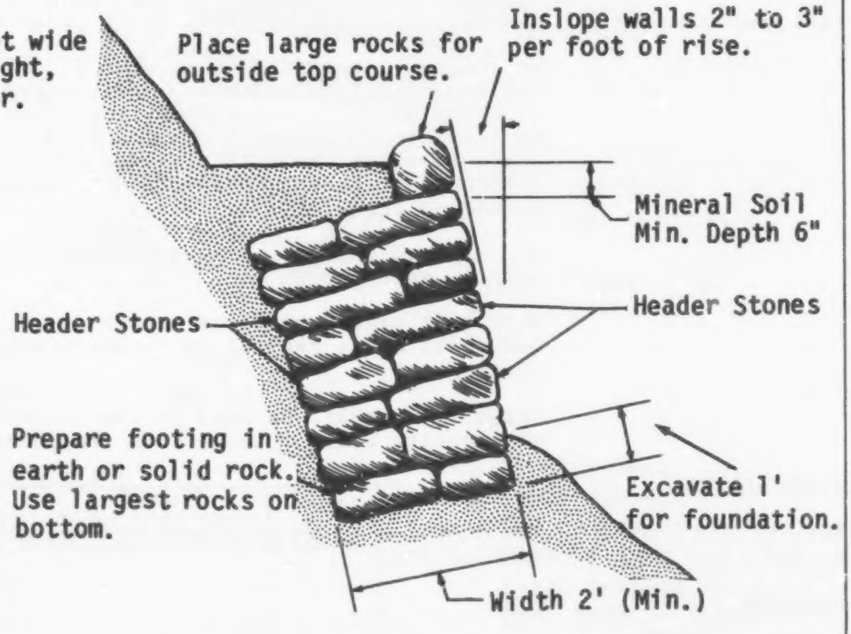
Pay Item	Pay Unit
935(01) Rock Retaining Wall	S.F.

935
.06

Rock Retaining Wall



FRONT VIEW


Place large rocks for outside top course.
Inslope walls 2" to 3" per foot of rise.
Mineral Soil Min. Depth 6"
Header Stones
Header Stones
Prepare footing in earth or solid rock. Use largest rocks on bottom.
Excavate 1' for foundation.
Width 2' (Min.)

Wall shall be 2 feet wide or 1/2 the wall height, whichever is greater.

Location	Height

CROSS SECTION A-A
ROCK RETAINING WALL

Section 936 - (Reserved)

936

Section 937 - Trail Stairways

DESCRIPTION

937.01
Work

This work consists of constructing log, rock, plank, crib-ladder, and pinned stairways and handrails as SHOWN ON THE DRAWINGS and DESIGNATED ON THE GROUND. This work shall include furnishing all hardware, lumber, and timbers.

MATERIALS

937.02
Requirements

Materials shall meet the requirements of the following sections:

961-Stone and Rock
962-Material for Timber Structures

CONSTRUCTION

937.03
General

Stairways shall be constructed in accordance with Forms FS-7700-91 and FS-7700-92. All backfill shall be compacted mineral soil. The stair run will vary depending on the ground slope but shall not be less than 10 inches.

937.04
Overlapping Rock Stairways

Steps shall be constructed from the bottom to the top. Single rocks shall form the entire tread and riser, and two or more contact points shall be made to provide stability.

937.05
Log Riser Stairways

Single logs shall be used for the entire riser.

937.06
Rock Riser Stairways

Rock risers shall be trenched into the soil to the depth necessary to provide stability. Single rocks shall be used to form the entire riser.

937
.01

937.07
Pinned Stairway

When constructing preservative-treated pinned stairways, the rock base shall be cleaned of spalls, roots, soil, and other obstructions.

Two 5/8-inch holes shall be drilled into the treads from the bottom side to match the positions of the holes in the rock and provide for the correct position of the step. These holes shall not penetrate the top of the tread. The bottom surface of the treads shall be hewn so as to provide a firm, solid contact with the rock base. This contact need not be continuous but must provide a firm, solid bearing.

The tread shall then be placed on the reinforcing bars and driven down to its solid position.

937.08
Crib-Ladder Stairway

Preservative-treated crib-ladder stairways shall be constructed by laying two carriages parallel to each other and firmly supported their entire length to the dimensions SHOWN ON FORM FS-7700-92. The area behind the riser shall be backfilled with compacted mineral soil and sloped outwards.

937.09
Plank Stairway

Preservative-treated plank stairways shall be constructed by laying two parallel carriages as DESIGNATED ON THE GROUND. Each carriage shall be a continuous member throughout its full length. The bottom of each carriage shall be firmly imbedded in the ground. Each carriage shall be supported by a sill at each end.

937.10
Handrails

When shown in the SCHEDULE OF ITEMS, handrails shall be constructed as SHOWN ON FORM FS-7700-92

MEASUREMENT

937.11
Method

When the quantity to be paid for will be measured by linear foot, measurement of the centerline of the stairway will be from the front of the bottom riser to the front of the top riser. Otherwise, measurement will be in accordance with Section 906.

PAYMENT

937.12
Basis

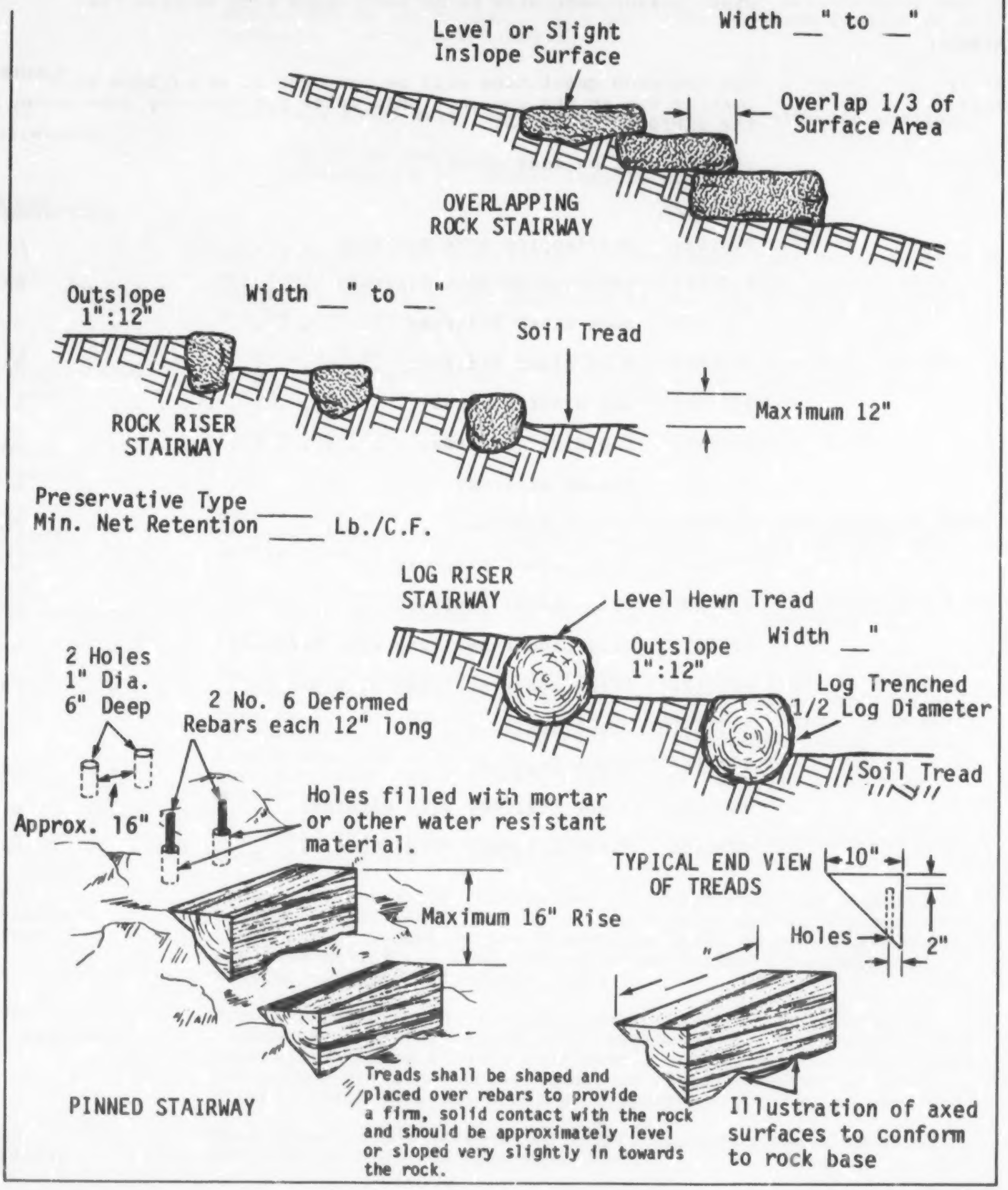
The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
937(01)	Overlapping Rock Stairway	L.F.
937(02)	Overlapping Rock Stairway	EA
937(03)	Rock Riser Stairway	L.F.
937(04)	Rock Riser Stairway	EA
937(05)	Log Riser Stairway	L.F.
937(06)	Log Riser Stairway	EA
937(07)	Pinned Stairway	L.F.
937(08)	Pinned Stairway	EA
937(09)	Crib-Ladder Stairway	L.F.
937(10)	Crib-Ladder Stairway	EA
937(11)	Crib-Ladder Stairway with Handrail	L.F.
937(12)	Crib-Ladder Stairway with Handrail	EA
937(13)	Plank Stairway	L.F.
937(14)	Plank Stairway	EA
937(15)	Plank Stairway with Handrail	L.F.
937(16)	Plank Stairway with Handrail	EA

Trail Stairways

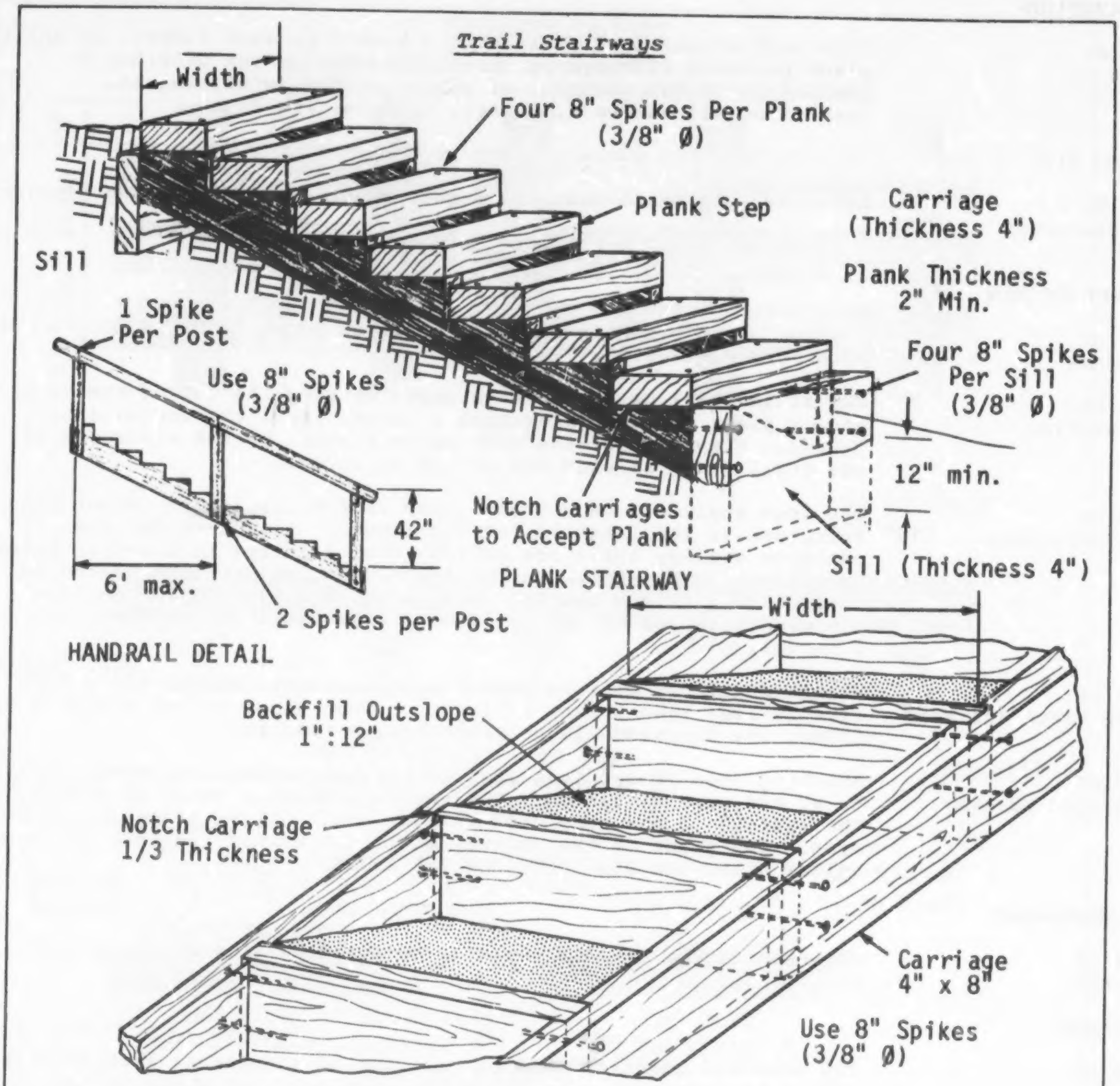
937
.12


Level or Slight Inslope Surface
Width __" to __"
Overlap 1/3 of Surface Area
OVERLAPPING ROCK STAIRWAY
Outslope 1":12"
Width __" to __"
Soil Tread
Maximum 12"
ROCK RISER STAIRWAY
LOG RISER STAIRWAY
Level Hewn Tread
Outslope 1":12"
Width __"
Log Trenched 1/2 Log Diameter
Soil Tread
2 Holes 1" Dia. 6" Deep
2 No. 6 Deformed Rebars each 12" long
Approx. 16"
Holes filled with mortar or other water resistant material.
Maximum 16" Rise
TYPICAL END VIEW OF TREADS
10"
Holes
2"
"
PINNED STAIRWAY
Illustration of axed surfaces to conform to rock base

Preservative Type ____
Min. Net Retention ____ Lb./C.F.

Treads shall be shaped and placed over rebars to provide a firm, solid contact with the rock and should be approximately level or sloped very slightly in towards the rock.

Trail Stairways



CRIB-LADDER STAIRWAY

Stairway Dimensions

Location	Type	Rise	Width	Carriage Length

Preservative Type ____
Min. Net Retention ____ Lb./C.F.

Section 938 - Puncheon Walkways

DESCRIPTION

938.01
Work

This work consists of constructing hewn log, sawn lumber, or split plank puncheon walkways at locations SHOWN ON THE DRAWINGS or DESIGNATED ON THE GROUND. It shall include furnishing and installing all hardware, lumber, timbers, and logs.

MATERIALS

938.02
Requirements

All materials shall meet the requirements of the following section:

962-Material for Timber Structures

CONSTRUCTION

938.03
General

Log and plank puncheon walkways shall be constructed in accordance with Form FS-7700-93.

938.04
Excavation

Mud sills shall be buried to a depth whereby the top of the hewn log or plank is not higher than 6 inches above the surrounding ground. Elevation of the deck surface shall be the elevation of the trail grade at each end of the structure.

938.05
Log Stringers

The logs shall not be cut less than 12 feet in length unless the structure is less than 12 feet in length. Logs used for the puncheon walkway shall not be less than 8 inches in diameter prior to flattening the top. The bottom of the log shall be flattened to provide a 4-inch bearing surface at each mud sill. The final minimum thickness of the log at the sill shall not be less than 3 inches.

938.06
Sawn Plank Stringer

Planks shall not be less than 8 feet in length unless the structure is less than 8 feet in length. When shown in the SCHEDULE OF ITEMS, the planks shall be preservative treated.

938.07
Finished Walkway

Abutting ends of sections of log or plank puncheon walkways shall be at the same elevation. The entire structure shall be stable. The surface of the completed walkway shall not be sloped to either side. The grade of the walkway shall not exceed 1/4 inch per foot unless otherwise DESIGNATED ON THE GROUND.

MEASUREMENT

938.08
Method

The quantity to be paid for will be measured in accordance with Section 906.

PAYMENT

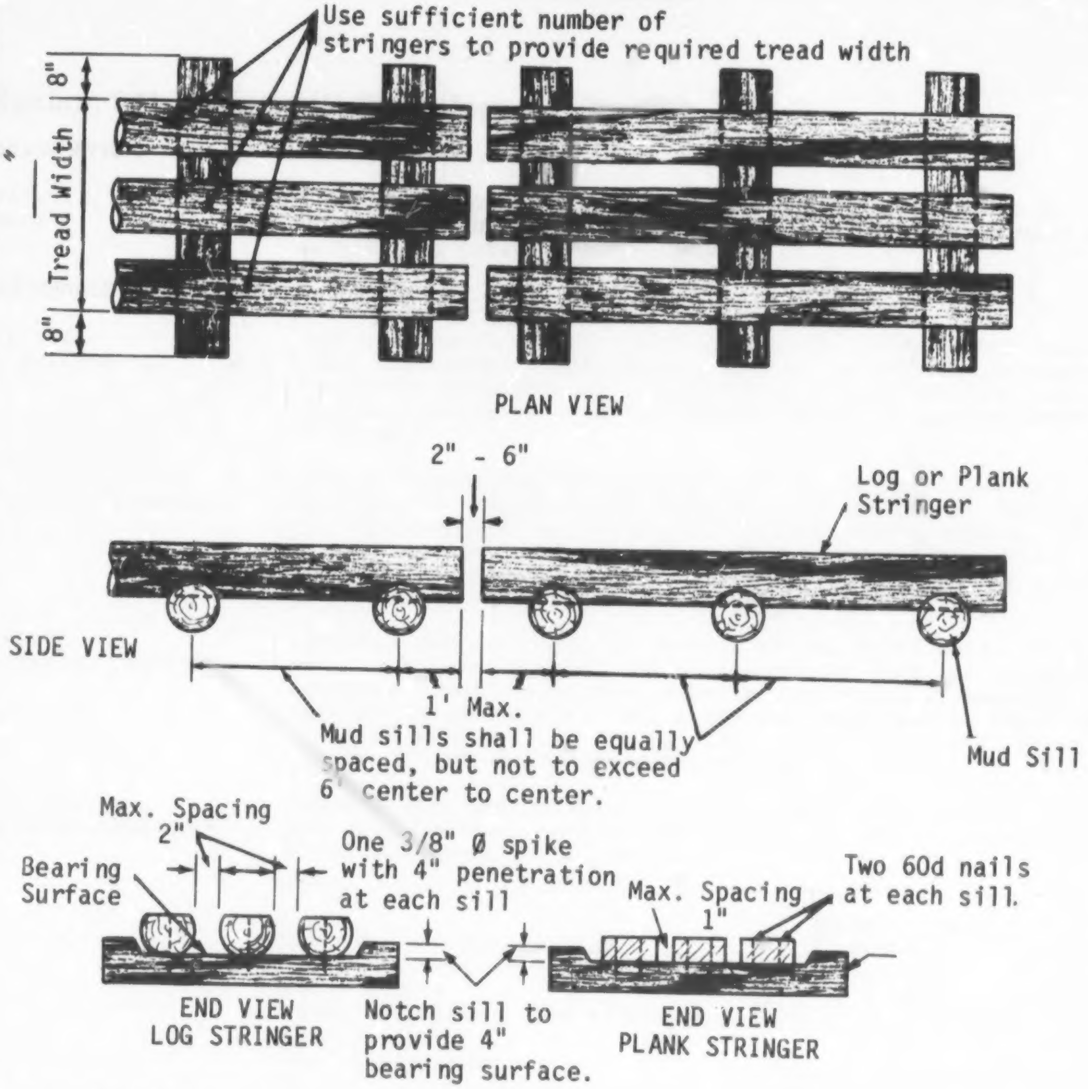
938.09
Basis

The accepted quantity will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
938(01)	Puncheon Walkway - Log	L.F.
938(02)	Puncheon Walkway - Sawn Plank	L.F.
938(03)	Puncheon Walkway - Sawn Plank-Treated	L.F.

Puncheon Walkway


Use sufficient number of stringers to provide required tread width
8"
Tread Width
8"
PLAN VIEW
2" - 6"
Log or Plank Stringer
SIDE VIEW
1' Max.
Mud sills shall be equally spaced, but not to exceed 6' center to center.
Mud Sill
Max. Spacing 2"
Bearing Surface
One 3/8" Ø spike with 4" penetration at each sill
Max. Spacing 1"
Two 60d nails at each sill.
END VIEW LOG STRINGER
Notch sill to provide 4" bearing surface.
END VIEW PLANK STRINGER

938
.09

Puncheon Walkways

Type	Species	Size
Mud Sill		
Log Stringer		
Sawn Plank Stringer		
Sawn Plank Treated Stringer		

Preservative Type ____
Min. Net Retention ____ Lb./C.F.

FS-7700-93 (6/84)

SECTION 940 SURFACING

Section 941 - Aggregate Surfacing

DESCRIPTION

941.01
Work

This work shall consist of furnishing, hauling, watering, placing, and compacting aggregate surfacing. Aggregate production shall be by pit run, screening, or crushing.

MATERIALS

941.02
Requirements

Materials shall be obtained from sources SHOWN ON THE DRAWINGS or other sources approved by the Engineer in writing. Crushing or screening operations on Government land shall utilize all suitable material encountered in the source, unless otherwise SHOWN ON THE DRAWINGS.

941.03
Pit-Run Aggregate

Pit-run aggregates shall consist of native materials of a size and grading that can be taken directly from the source and placed on the trail without crushing or screening. No gradation, other than a maximum size, will be required. The maximum size shall be as SHOWN ON THE SCHEDULE OF ITEMS. Quality requirements will be as SHOWN IN THE SPECIAL PROJECT SPECIFICATIONS.

941.04
Screened Aggregate

Material shall consist of gravel, talus, rock, sand, shale, or other suitable material and be reasonably hard and durable and reasonably free of organic material, mica, clay lumps, or other deleterious materials. The gradation requirements shall be as SHOWN ON FORM FS-7700-94. Quality requirements will be as SHOWN IN THE SPECIAL PROJECT SPECIFICATIONS.

941.05
Crushed Aggregate

Crushed aggregate shall be crushed stone, slag, or gravel meeting the requirements shown in the following table or as SHOWN IN THE SPECIAL PROJECT SPECIFICATIONS.

Description	AASHTO Test Method	Requirement
Percent Wear	T 96	41 Max.
Durability Index, Coarse and Fine	T 211	35 Min.
Liquid Limit	T 89	35 Max.
Plasticity Index	T 91	2 - 11

The crushed aggregate gradation shall be as SHOWN ON FORM FS-7700-94. Aggregate shall be well graded from coarse to fine within the gradation band.

When crushed aggregate is used, at least 90 percent by weight of the particles retained on the No. 4 sieve shall have at least one fractured face. Naturally fractured faces may be included in the 90 percent requirement.

941.06
Handling Materials

Aggregates shall be stockpiled, removed, and transported in a manner that will preserve specified gradation and avoid contamination. Stockpiles of aggregate having different gradations shall not be intermingled.

941.07
Sampling
Aggregate

The contractor shall submit test results and a Certificate of Compliance that states that the gradation of the aggregate meets the contract requirements.

Sampling of the material before incorporation into the work shall occur as follows:

(a) For onsite produced materials at crushing or screening plants, after additions of any necessary blending material.

(b) For commercially produced aggregates, at the producer's plant or stockpile.

(c) For gradation of combined aggregate in bituminous plant mixtures, either before or after introduction of bituminous material.

The sampling shall not be considered a final acceptance and shall not preclude later sampling and testing after final processing of the material. Such sampling shall not relieve the contractor of responsibility of providing quality control measures to ensure compliance with contract requirements.

CONSTRUCTION

941.08 Preparation of Trailbed

The trailbed shall be prepared and finished as required under Sections 912, 913, or 915 and approved by the Engineer in writing before placing aggregate.

941.09 Watering

When watering is specified on the SCHEDULE OF ITEMS, the aggregate being compacted shall be damp throughout the mixture and as SHOWN ON FORM FS-7700-94. Water sources, access, and operating procedures will be SHOWN ON THE DRAWINGS. The contractor shall furnish all equipment, labor, and materials needed to operate the water supply.

941.10 Spreading & Compacting

When uniformly mixed, the material shall be spread in layers that will compact to the specified moisture content, thickness, and width SHOWN ON FORM FS-7700-94.

Immediately following final spreading and smoothing, each layer shall be compacted. Any irregularities or depressions that develop shall be corrected by adding or removing material until the surface is smooth and uniform.

941.11 Acceptance, Testing, Sampling, & Tolerances

The total compacted thickness of the aggregate shall not vary more than 1/2 inch from the specified thickness nor shall it be consistently below or above the specified thickness.

The aggregate width shall not vary more than ± 3 inches from the specified width and shall not be consistently narrower or wider than the specified width.

MEASUREMENT

941.12 Method

The quantity to be paid for will be measured in accordance with Section 906.

Work required under Sections 912, 913, or 915 will be measured and paid for under those sections.

PAYMENT

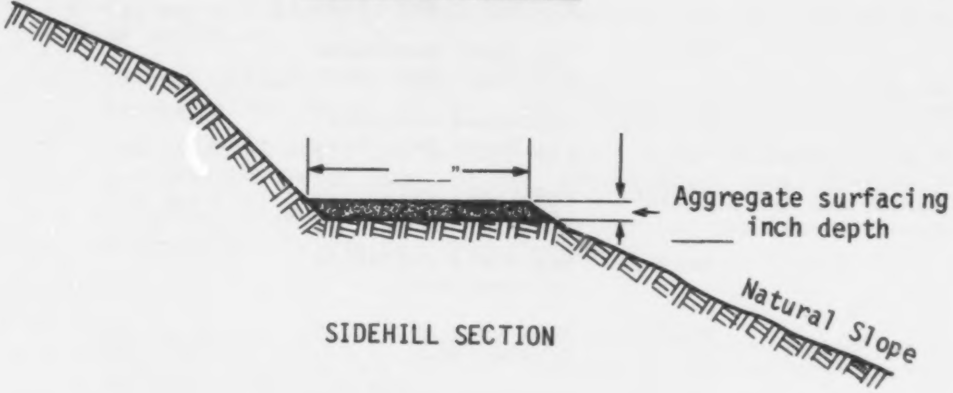
941.13 Basis

The accepted quantities will be paid for in accordance with Section 906 at the contract unit price of each pay item shown in the SCHEDULE OF ITEMS.

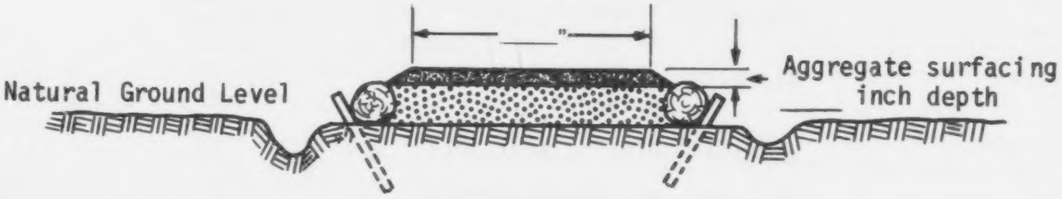
Payment will be made under:

Pay Item		Pay Unit
941(01)	Aggregate Surfacing, Pit Run Pit Run - Max. Size [--]"	L.F.
941(02)	Aggregate Surfacing Pit Run - Max. Size [--]"	C.Y.
941(03)	Aggregate Surfacing Pit Run - Max. Size [--]"	Ton
941(04)	Aggregate Surfacing Crushed Rock	L.F.
941(05)	Aggregate Surfacing Crushed Rock	C.Y.
941(06)	Aggregate Surfacing Crushed Rock	Ton
941(07)	Aggregate Surfacing Screened	L.F.
941(08)	Aggregate Surfacing Screened	C.Y.
941(09)	Aggregate Surfacing Screened	Ton
941(10)	Placing Aggregate	L.F.
941(11)	Placing Aggregate	C.Y.
941(12)	Placing Aggregate	Ton
941(13)	Placing Aggregate	L.S.

Aggregate Surfacing

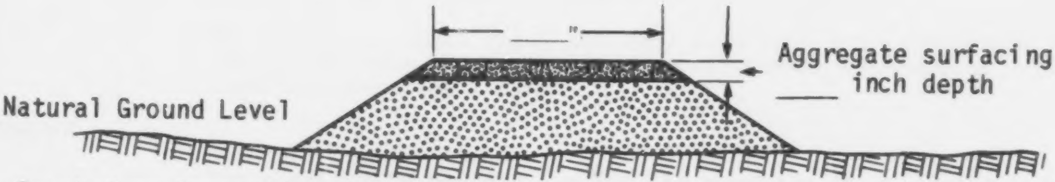


SIDEHILL SECTION



TURNPIKE SECTION

941
.13



FILL SECTION

Crushed or Screened Aggregate Grading Requirements

Sieve Size	Percent Passing AASHTO T 11 and T 27
2 inch	
1-1/2 inch	
1 inch	
3/4 inch	
1/2 inch	
No. 4	
No. 8	
No. 30	
No. 200	

Moisture Content
__% Min.
__% Max.

FS-7700-94 (6/84)

Section 942 - Bituminous Surfacing

DESCRIPTION

942.01
Work

This work shall consist of furnishing an aggregate and bituminous material mixed in a plant, hauling the bituminous mixture to the point of application, and spreading and compacting the bituminous mixture on a prepared surface.

MATERIALS

942.02
Composition of Mixture

The bituminous mixture shall be composed of aggregate, filler, and bituminous material combined in the proportions specified in the job-mix formula approved in writing by the Engineer.

Before use, the contractor shall submit certified test results and job-mix formula from an Engineer-approved commercial testing lab for the bituminous mixture to be incorporated into the work. Test results and job-mix formulas for bituminous materials being used on county, State, or Federal agency work may be submitted to the Engineer for written approval. Within 7 calendar days after receipt of the certified test results and job-mix formula, the Engineer will notify the contractor if the bituminous mixture is approved for use.

Job-mix formula furnished by the contractor shall include:

(a) The gradation of the aggregate.

(b) The amount and grade of bituminous binder.

(c) The amount, if any, of filler.

(d) Percent wear and sand equivalent of the aggregate using AASHTO test methods T 96 and T 176, respectively.

(e) Stripping test and stabilometer value of the bituminous mixture using AASHTO test methods T 182 and T 246, respectively.

(f) The maximum combined moisture content of the mixture ingredients.

(g) Temperature of the mixture ingredients at time of mixing, temperature of mix leaving mixture, and temperature of mix delivered on trail.

(h) Maximum density.

Emulsified asphalt mixtures shall be prepared in accordance with the Asphalt Institute Mix Design Method described in FHWA-1P-79-1, Volume 2.

942.03
Bituminous Materials

Bituminous materials shall be of the type, grades, and percent bitumen SHOWN ON FORM FS-7700-95 and meet the following requirement.

(a) Asphalt cement. AASHTO M 226, Table 3.

942.04
Aggregate & Mineral Filler

Aggregate shall meet the requirements SHOWN ON FORM FS-7700-95. Mineral filler shall meet the requirements of AASHTO M 17.

CONSTRUCTION

942.05
Bituminous Mixing Plant

Plants currently producing acceptable bituminous materials for local state highway departments will be acceptable.

942.06 Weather Limitations

The bituminous mixture shall not be placed when weather conditions prevent the proper handling or finishing of the mixture, when underlying base course is frozen, when raining, when the average underlying surface temperatures are less than 45° F, or when the atmospheric temperature in the shade is less than 50° F.

942.07 Mixing

The aggregates and the bituminous material shall be measured or gaged and introduced into the mixer in the amount specified in the job-mix formula.

After the required amounts of aggregate and bituminous material have been introduced into the mixer, the material shall be mixed until a complete and uniform coating of the particles and thorough distribution of the bituminous material throughout the aggregate is obtained.

942.08 Control of Bituminous Mixture

A current production of bituminous mixture is defective when an individual acceptance test result deviates from Target Values (TV) by more than the applicable amount shown in the following table or SHOWN IN THE SPECIAL PROJECT SPECIFICATIONS.

Mixture Characteristic	Tolerance Defining a Nondefective Test Result
Bitumen Content	TV± 0.5% by weight
3/8" sieve and larger	TV± 5.0% by weight
Number 4 sieve	TV± 5.0% by weight
Number 8 sieve	TV± 5.0% by weight
Number 16 sieve	TV± 5.0% by weight
Number 30 sieve	TV± 5.0% by weight
Number 50 sieve	TV± 5.0% by weight
Number 200 sieve	TV± 2.0% by weight
Temperature leaving mixer	TV± 10°F
Temperature delivered on the trail	TV± 15°F

942.09 Preparation of Trailbed

The trailbed shall be prepared and finished as required under Sections 912, 913, or 915 and approved by the Engineer in writing before placing the bituminous mixture. The location and type of edge forms, when required, will be SHOWN ON THE DRAWINGS.

942.10 Transporting, Spreading, Finishing, & Compacting

The mixture shall be transported from the mixing plant to the point of use in vehicles with tight, clean, and smooth metal beds that have been thinly coated with a material to prevent the mixture from adhering to the beds. Hauling vehicles shall be covered as necessary to protect the mixture.

The mixture shall be placed by mechanical equipment or hand tools at the locations and to the dimensions SHOWN ON THE DRAWINGS.

Compaction shall be performed by mechanical compactors to meet the requirements of Subsection 942.13(b). Any irregularities or depressions that develop shall be corrected by adding or removing material until the surface is smooth and uniform.

942.11 Certification with Shipment

When each load of bituminous material is delivered, the contractor shall furnish the Engineer with one copy of the Bill of Lading and fully executed Certificate of Compliance conforming to the format below (see figure 942-1). A separate Certificate of Compliance will not be required if the standard Bill of Lading contains the essential information required by the certificate.

942.12 Finished Work Samples

The contractor shall cut samples from the pavement when required by the Engineer. Sample size and location will be designated by the Engineer. Samples shall be neatly cut with a saw or core drill. Voids left by sampling shall be backfilled with bituminous mixture and compacted to the density of the surrounding material.

942.13 Acceptance Sampling & Testing of Bituminous Mixture

(a) Gradation and Bituminous Content. Acceptance samples of the mixture will be taken by the contractor in accordance with AASHTO T 168 after it has been discharged into hauling units. Samples will be selected on a random basis.

The contractor will take samples and make tests for bitumen content by means of AASHTO T 164 or by the vacuum extractor test. Gradation of the entire quantity of extracted aggregate will be determined by the contractor in accordance with AASHTO T 30. Test results will be compared to the job-mix formula as specified in Subsection 942.08 to determine acceptance.

(b) Compaction. After the bituminous mixture has been placed and compacted, the pavement shall meet the density requirements SHOWN ON FORM FS-7700-95. Testing will be in accordance with ASTM D 2950 or D 2922. If individual test results fall below the density requirements, additional field tests shall be run to verify the results. If the material continues to fail to meet the specified minimum density, the area shall be tested in accordance with AASHTO T 230. Samples shall be taken by the contractor in accordance with Subsection 942.12. Those areas failing to meet density requirements shall be replaced.

(c) Surface. Acceptance testing will be performed on the top surface. The surface shall be free draining and shall not deviate more than 1 inch from a 10-foot straight-edge placed in any direction on the paved surface, unless specified otherwise in SPECIAL PROJECT SPECIFICATIONS.

(d) Thickness. The total compacted thickness of the mixture shall not vary more than 1/2 inch from the specified thickness. The compacted thickness shall not be consistently below or above the specified thickness.

(e) Width. The pavement width shall not vary more than ±2 inches from the specified width and shall not be consistently narrower or wider than the specified width.

MEASUREMENT

942.14 Method

The quantity to be paid for will be measured in accordance with Section 906. Work required under Sections 912, 913, or 915 will be measured and paid for under those sections.

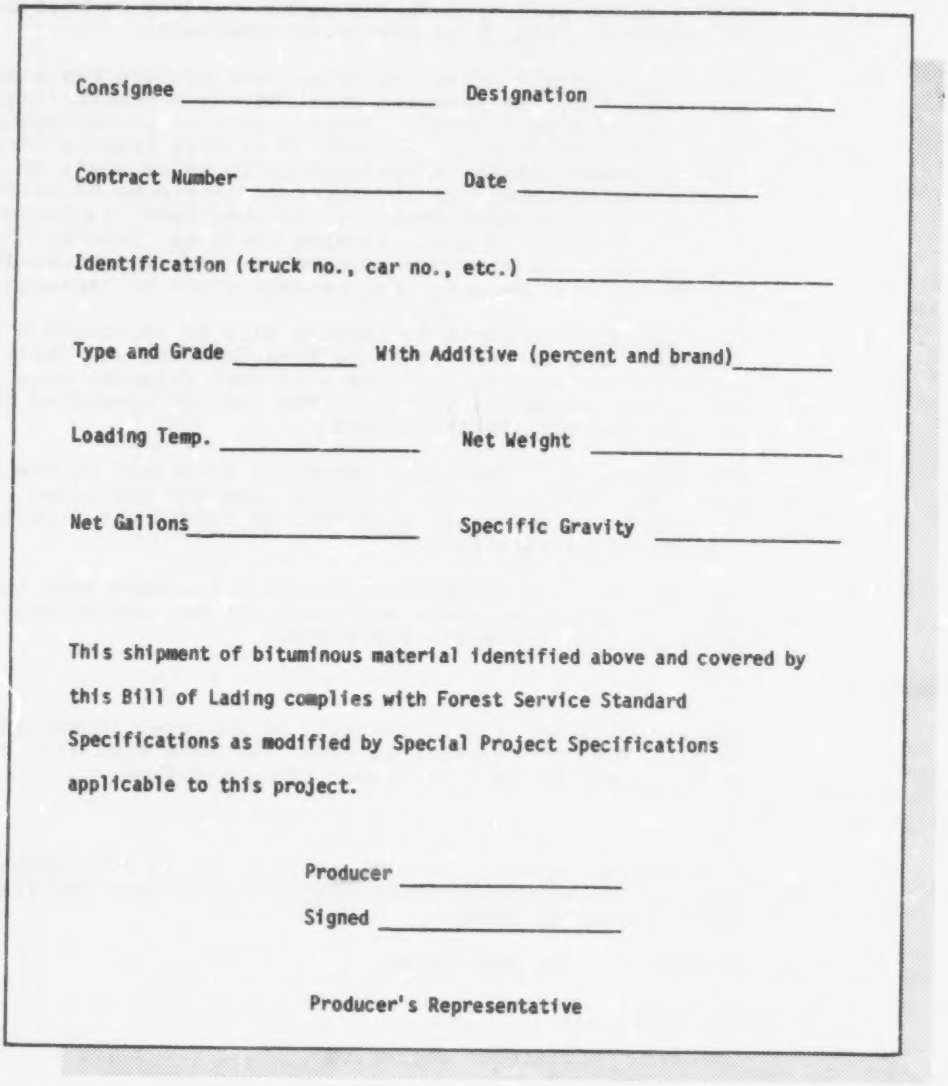
PAYMENT

942.15 Basis

The accepted quantities will be paid for in accordance with Section 906 at the contract unit price of each pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
942(01)	Bituminous Surfacing	L.F.
942(02)	Bituminous Surfacing	C.Y.
942(03)	Bituminous Surfacing	S.Y.
942(04)	Bituminous Surfacing	Ton



Consignee ____________ Designation ____________

Contract Number ____________ Date ____________

Identification (truck no., car no., etc.) ____________

Type and Grade ______ With Additive (percent and brand) ______

Loading Temp. ____________ Net Weight ____________

Net Gallons ____________ Specific Gravity ____________

This shipment of bituminous material identified above and covered by this Bill of Lading complies with Forest Service Standard Specifications as modified by Special Project Specifications applicable to this project.

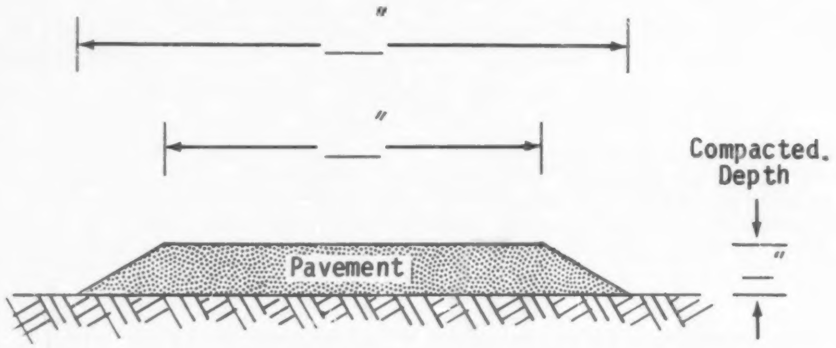
Producer ____________

Signed ____________

Producer's Representative

Figure 942-1.--Sample bill of lading & certificate of compliance

Bituminous Surfacing



Paving Materials				
Bituminous Materials			Aggregate	
Type	Grade	Percent Bitumen	Sieve Size	Percent Passing AASHTO T 11 and T 27
			2 inch	
			1-1/2 inch	
			1 inch	
			3/4 inch	
			1/2 inch	
			No. 4	
			No. 8	
			No. 30	
			No. 200	

Compaction--Minimum of ____ % of relative maximum density from job-mix formula.

Description	AASHTO Test Method	Requirement
Percent Wear	T 96	
Durability Index Coarse and Fine	T 210	
Sand Equivalent	T 176	
Stripping Test	T 182	

942
.15

SECTION 950 INCIDENTAL CONSTRUCTION

Section 951 - Mobilization

DESCRIPTION

951.01
Work

This work shall consist of preparatory work and operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site, and for all other work and operations that must be performed or that cause costs to be incurred before beginning work on the various items on the project site.

PAYMENT

951.02
Basis

The accepted work will be paid for at the contract unit price for the pay item SHOWN ON THE SCHEDULE OF ITEMS.

Progress payments will be made as follows:

(a) When 5 percent or more of the original contract amount is earned from other pay items, 50 percent of the amount for mobilization or 5 percent of the original contract amount, whichever is less, will be paid.

(b) When 10 percent or more of the original contract amount is earned from other pay items, 100 percent of the amount for mobilization or 10 percent of the original contract amount, whichever is less, will be paid.

(c) Upon completion of all work on the project, any unpaid amount for mobilization will be paid.

The total of all payments shall not exceed the original contract amount for this item.

Payment will be made under:

Pay Item		Pay Unit
951(01)	Mobilization	L.S.

Section 952 - Sign, Post, & Cairn Installation

DESCRIPTION

952.01
Work

This work shall consist of installing signs, constructing rock cairns, and furnishing and installing posts.

MATERIALS

952.02
Requirements

Materials shall meet the requirements of the following sections:

961-Stone and Rock
962-Material for Timber Structures

952.03
Sign Panels

Sign panels and hardware will be furnished by the Government at locations shown in SPECIAL PROJECT SPECIFICATIONS.

952.04
Native Wood Posts

Native wood post details and dimensions shall be as SHOWN ON FORM FS-7700-96. All wood posts shall be of sound, seasoned wood. The posts shall be straight and all knots trimmed flush with the surface. The requirements for peeling may be omitted for red cedar posts or bracing.

Native posts shall be 5 inches in diameter on the small end.

952.05
Treated Wood Posts

Treated wood posts shall meet the grading, species, and dimensional requirements SHOWN ON FORM FS-7700-96 and the requirements of Section 962.04.

Holes drilled in the post for the carriage bolts shall be snug, making a tight fit for the bolts.

952.06
Stone for Cairns

The stone used for cairns shall meet the requirements of Form FS-7700-97 and Section 961. Round stones shall not be used. Generally, stones shall have thicknesses of not less than 5 inches. Fifty percent of the stone shall be greater than 1/2 cubic foot in volume.

CONSTRUCTION

952.07
Performance

The signs, posts, and cairns shall be erected at the locations SHOWN ON FORM FS-7700-96 or FORM FS-7700-97 and DESIGNATED ON THE GROUND.

952.08
Sign Installation

The signpost shall be notched for the sign panel one-half the thickness of the sign substrate. The top of the sign panel will be flush with the top of the post.

Sign panels shall be mounted as SHOWN ON FORM FS-7700-96. Tightened hardware shall be snug but not rupture the sign panel surface.

When the horizontal length of the sign is more than 36 inches, two posts will be used. The outside edge of the posts shall be inset 2 inches from the end of the sign.

952.09
Post Installation

The posthole shall not be more than 6 inches in diameter unless soil conditions warrant otherwise. If necessary due to obstacles, the posthole may be moved within the tolerances SHOWN ON FORM FS-7700-96.

If the posthole cannot be dug 30 inches deep, the posthole shall be dug again at another location within the limits SHOWN ON FORM FS-7700-96 or the post stabilized by concrete or rock mounds built in accordance with rock cairn specifications.

The backfill material between the post and the posthole shall be hand compacted in 4-inch layers to produce a solid and plumb installation.

952.10
Rock Cairn
Construction

Cairns shall be constructed in layers as SHOWN ON FORM FS-7700-97. Each layer shall slope towards the center. Each stone placed shall have at least three points of contact. Wedging small stones into cracks between large stones to stabilize the large stones will not be allowed.

MEASUREMENT

952.11
Method

The quantity to be paid for will be measured in accordance with Section 906.

Rock cairns built to support signposts will be considered incidental to the pay item for native or treated signpost installation.

PAYMENT

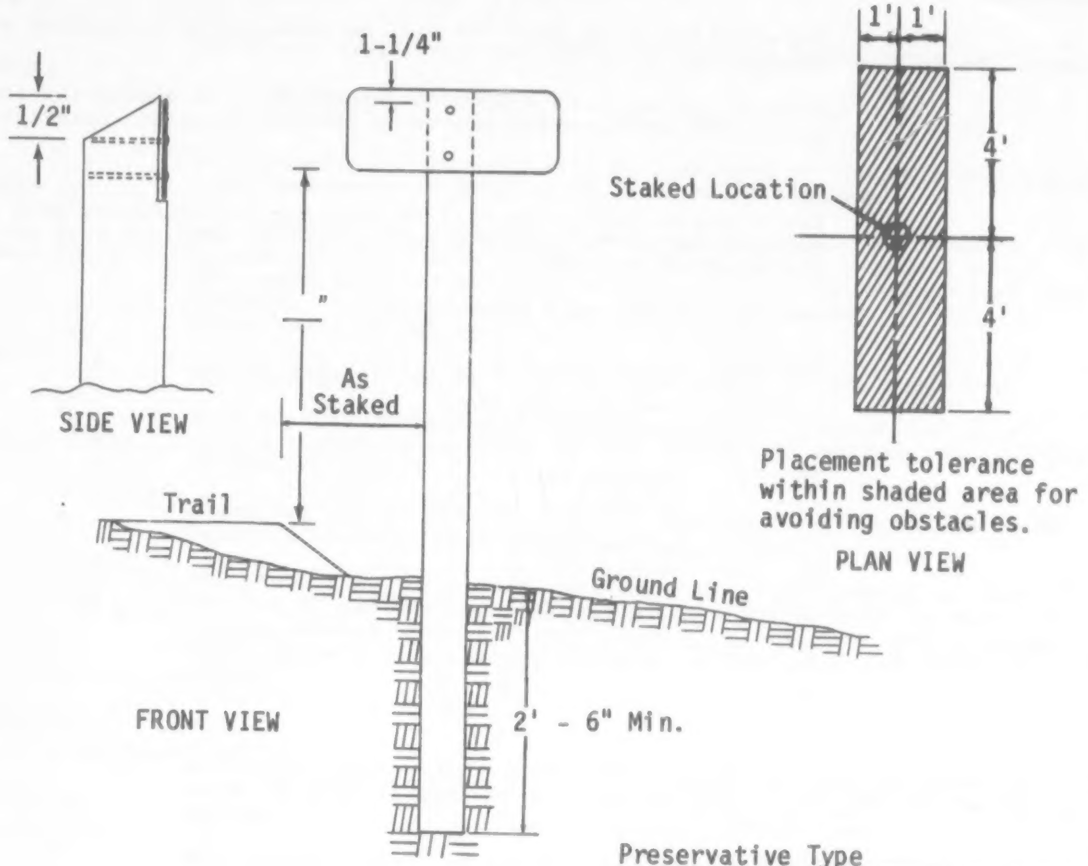
952.12
Basis

The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item shown in the SCHEDULE OF ITEMS.

Payment will be made under:

Pay Item		Pay Unit
952(01)	Install Sign Panel Government Furnished	EA
952(02)	Treated Posts Length [-]' - Dia. [--]"	EA
952(03)	Native Posts Length [-]'	EA
952(04)	Rock Cairns	EA

Sign & Post Installation Diagram

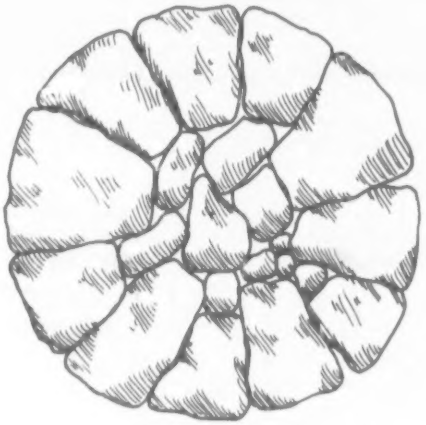


Preservative Type ____
Min. Net Retention ____ Lb./C.F.

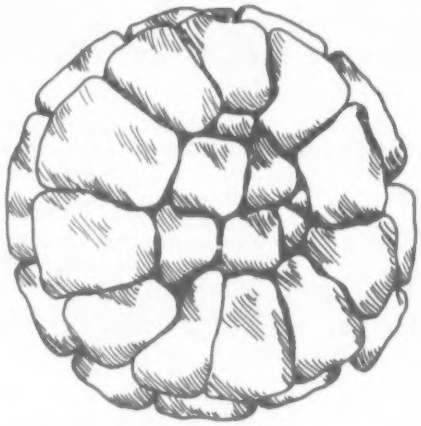
Posts				Sign Message
Location	Species	Grading	Size	

952
.12

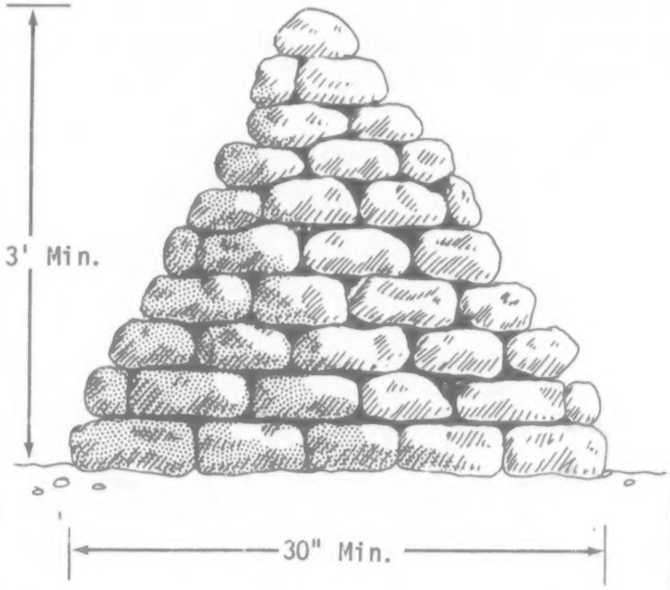
Rock Cairn Construction



FIRST LAYER



SECOND LAYER
Note joints of first layer are bridged by second stones.



952
.12

Locations

Section 953 - Log & Rock Barriers

DESCRIPTION

953.01
Work

This work shall consist of constructing native log, treated timber, or rock safety or traffic barriers of the types and at the locations SHOWN ON THE DRAWINGS. Work shall include tree and log cutting, debris disposal, and transporting and installing logs or rocks.

MATERIALS

953.02
Requirements

Materials shall meet the requirements of the following sections:

961-Stone and Rock
962-Material for Timber Structures

CONSTRUCTION

953.03
Trailbed Widening

Construction of extra trailbed width for installation of barriers shall be as SHOWN ON THE DRAWINGS and as specified under Section 912.

953.04
Barrier Installation

For each type of barrier, installation shall be AS SHOWN ON FORMS FS-7700-98 through FS-7700-104.

MEASUREMENT

953.05
Method

The quantity to be paid for will be measured in accordance with Section 906 and will include allowable spaces between individual logs or rocks in each barrier section. Trailbed widening will be considered incidental to other pay items and extra payment will not be given.

PAYMENT

953.06
Basis

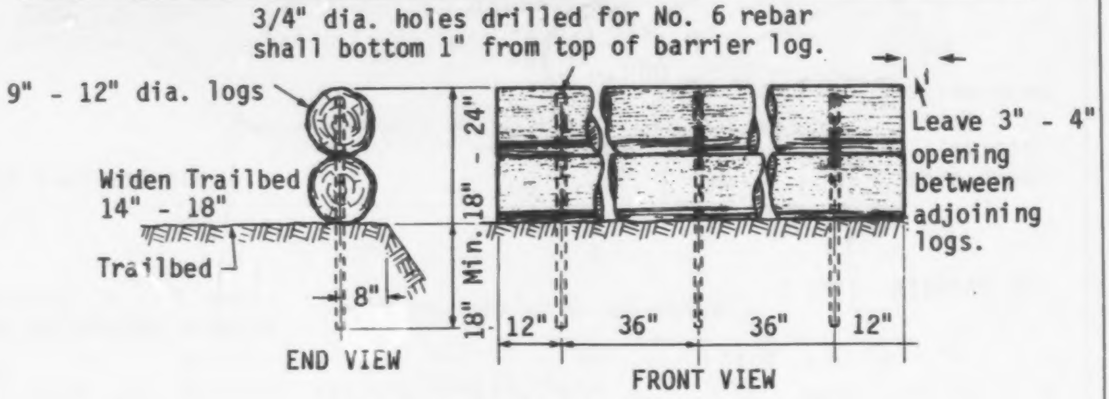
The accepted quantities will be paid for in accordance with Section 906 at the contract unit price for each pay item listed in the SCHEDULE OF ITEMS.

Pay Item		Pay Unit
953(01)	Log Barrier, [--]" - Type A	L.F.
953(02)	Log Barrier, [--]" - Type B	L.F.
953(03)	Log Barrier, [--]" - Type C	L.F.
953(04)	Log Barrier, [--]" - Type D	L.F.
953(05)	Log Barrier, [--]" - Type E	L.F.
953(06)	Rock Barrier, [--]" - Type F	L.F.
953(07)	Rock Barrier, [--]" - Type G	L.F.
953(08)	Rock Barrier, [--]" - Type H	L.F.
953(09)	Treated Timber Barrier, [--]" - Type I	L.F.
953(10)	Treated Timber Barrier, [--]" - Type J	L.F.
953(11)	Treated Timber Barrier, [--]" - Type K	L.F.
953(12)	Treated Timber Barrier, [--]" - Type L	L.F.
953(13)	Treated Timber Barrier, [--]" - Type M	L.F.

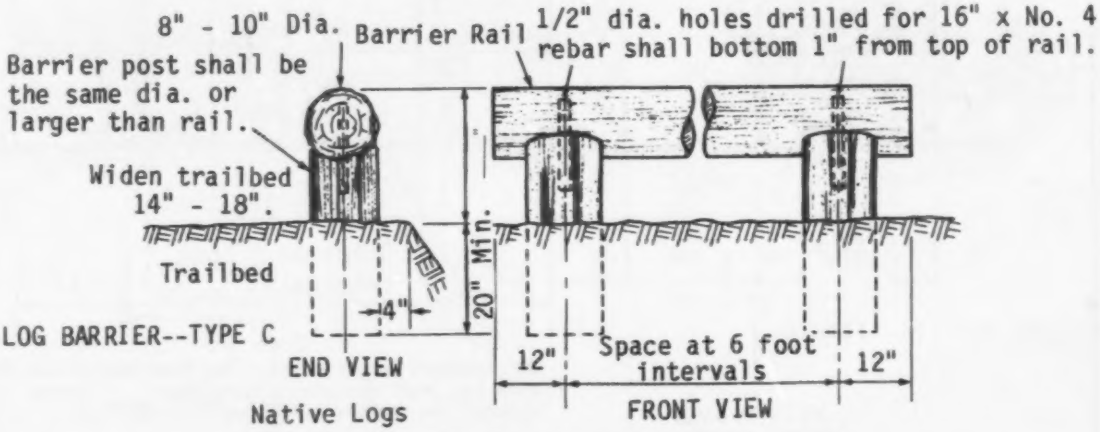
953
.01

Log Barriers

LOG BARRIER--TYPE A - Identical to Type B except single log 18" - 24" diameter laid on ground. Drilling details same as for top log in Type B.


3/4" dia. holes drilled for No. 6 rebar shall bottom 1" from top of barrier log.
9" - 12" dia. logs
Widen Trailbed 14" - 18"
Trailbed
8"
18" Min.
18" - 24"
END VIEW
Leave 3" - 4" opening between adjoining logs.
12"
36"
36"
12"
FRONT VIEW

LOG BARRIER--TYPE B


8" - 10" Dia.
Barrier Rail
1/2" dia. holes drilled for 16" x No. 4 rebar shall bottom 1" from top of rail.
Barrier post shall be the same dia. or larger than rail.
Widen trailbed 14" - 18".
Trailbed
4"
20" Min.
END VIEW
12"
Space at 6 foot intervals
12"
FRONT VIEW

LOG BARRIER--TYPE C

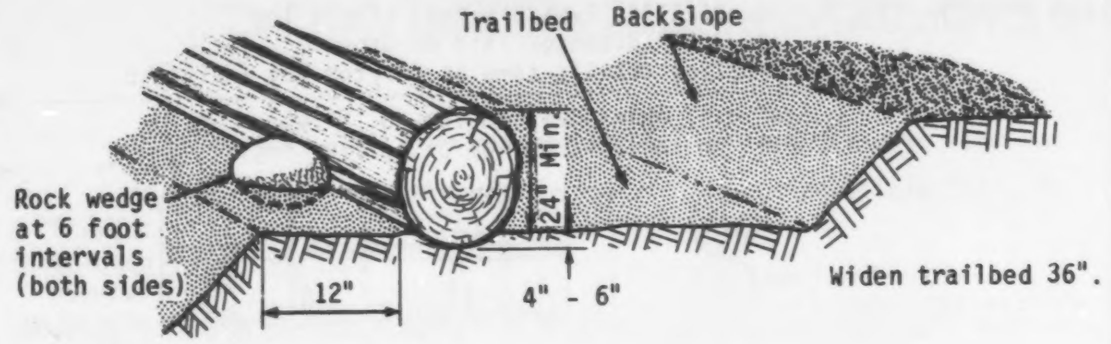
Native Logs

Type	Location	Species
	to	
	to	
	to	
	to	
	to	

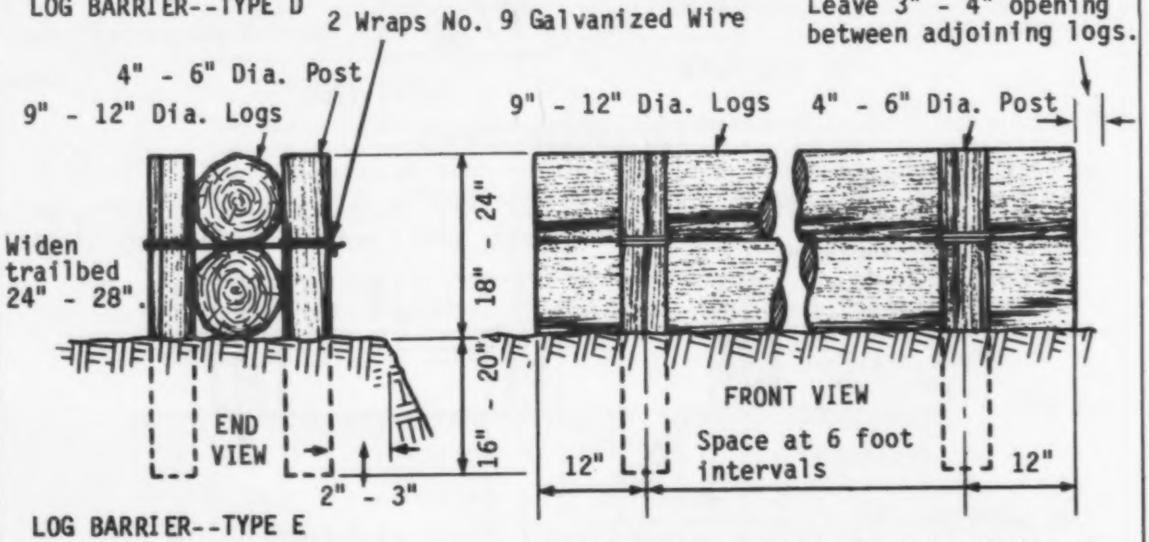
953
.06

READEX FICHE

Log Barriers



LOG BARRIER--TYPE D


2 Wraps No. 9 Galvanized Wire
Leave 3" - 4" opening between adjoining logs.
4" - 6" Dia. Post
9" - 12" Dia. Logs
9" - 12" Dia. Logs
4" - 6" Dia. Post
Widen trailbed 24" - 28".
18" - 24"
16" - 20"
END VIEW
2" - 3"
FRONT VIEW
Space at 6 foot intervals
12"
12"

LOG BARRIER--TYPE E

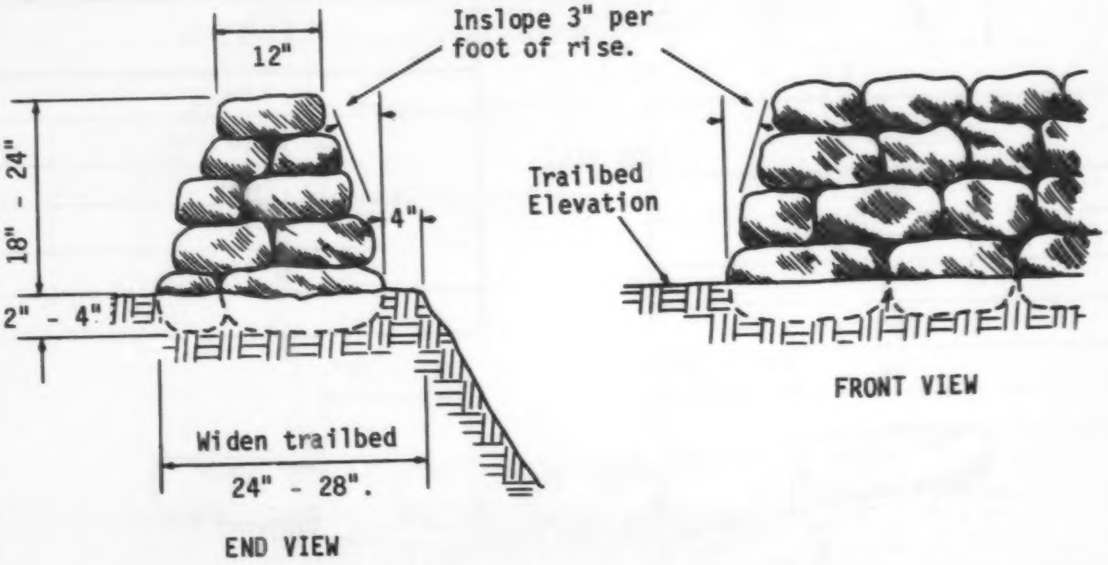
Straightness Requirements: The true centerline of each log shall deviate no more than ____ inches between the centers of the ends of the logs.

Native Logs

Type	Location	Species
	to	
	to	
	to	
	to	
	to	

953
.06

Rock Barrier Type F

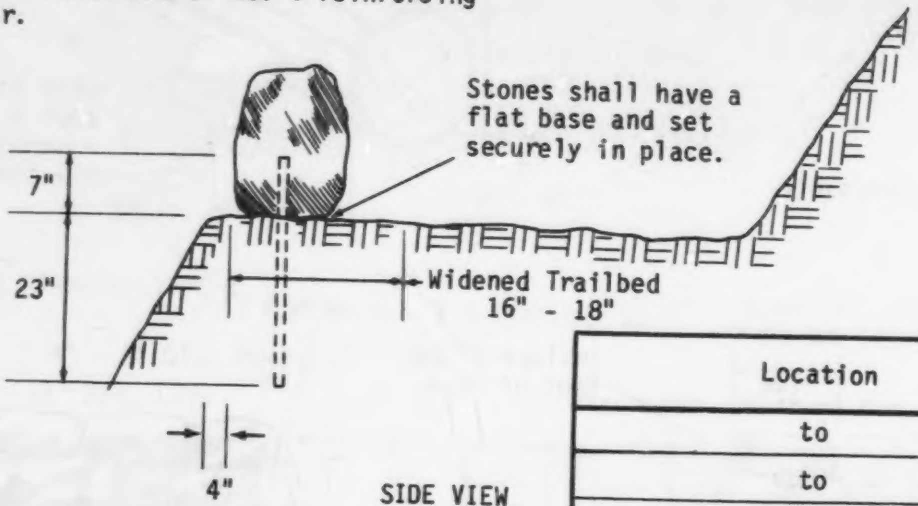


Location
to
to
to
to
to

953
.06

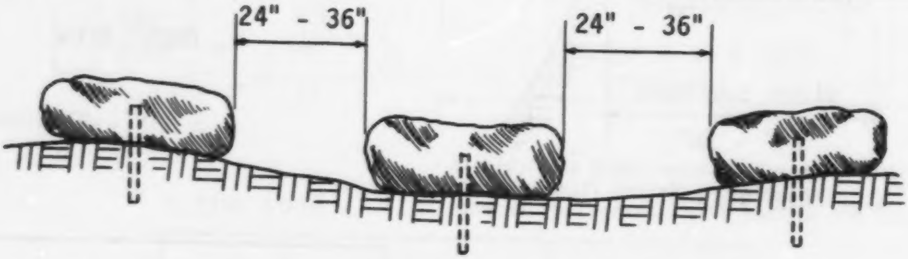
Rock Barrier Type G

Steel rod used to pin barrier stones to trailbed shall be 3/4" Ø by 30" mild steel rod or No. 6 reinforcing bar.



SIDE VIEW

Location
to
to
to
to
to



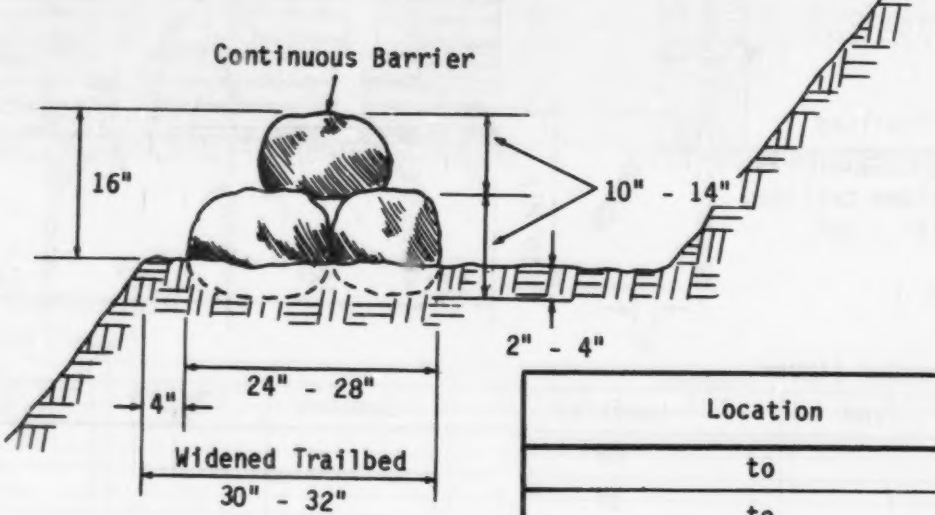
Size of barrier stones shall be (approx.) 14" in height and width and 24" long. Minimum dimension shall not be less than 12" for height and width and 18" for length.

FRONT VIEW SHOWING SPACING
BETWEEN STONES

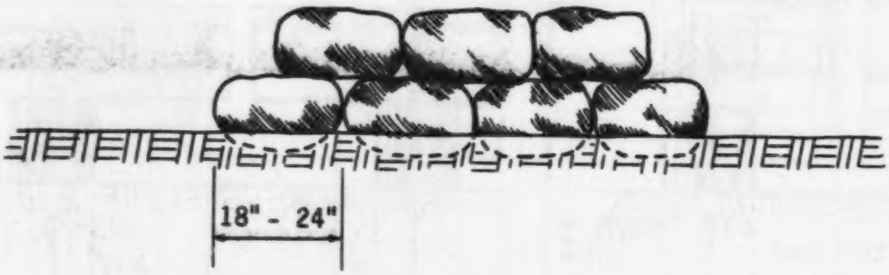
953
.06

Rock Barrier Type H

SIDE VIEW



Location
to
to
to
to
to

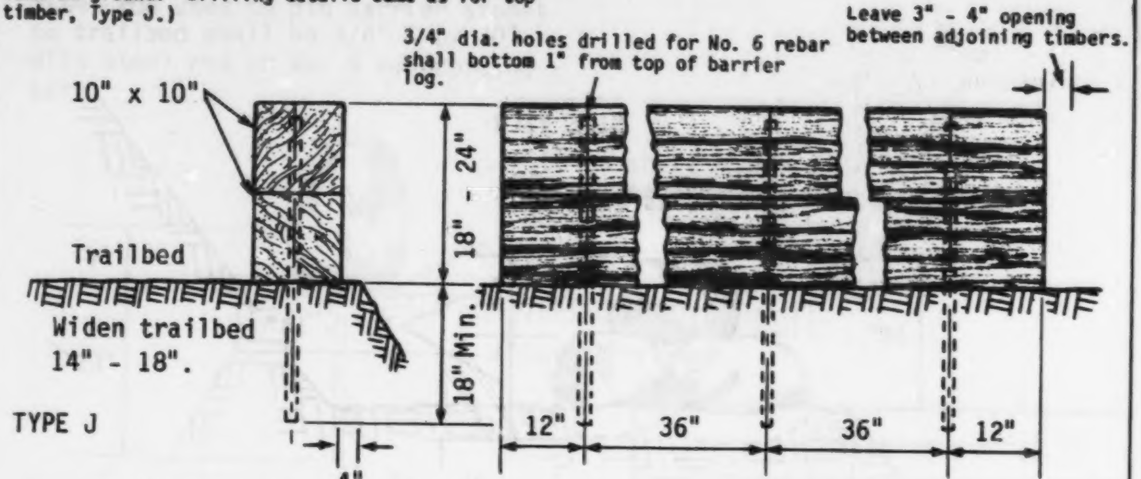


Size of barrier stones shall be (approx.) 14" in height and width and 24" long. Minimum dimension shall not be less than 12" for height and width and 18" for length.

FRONT VIEW

Treated Timber Barriers

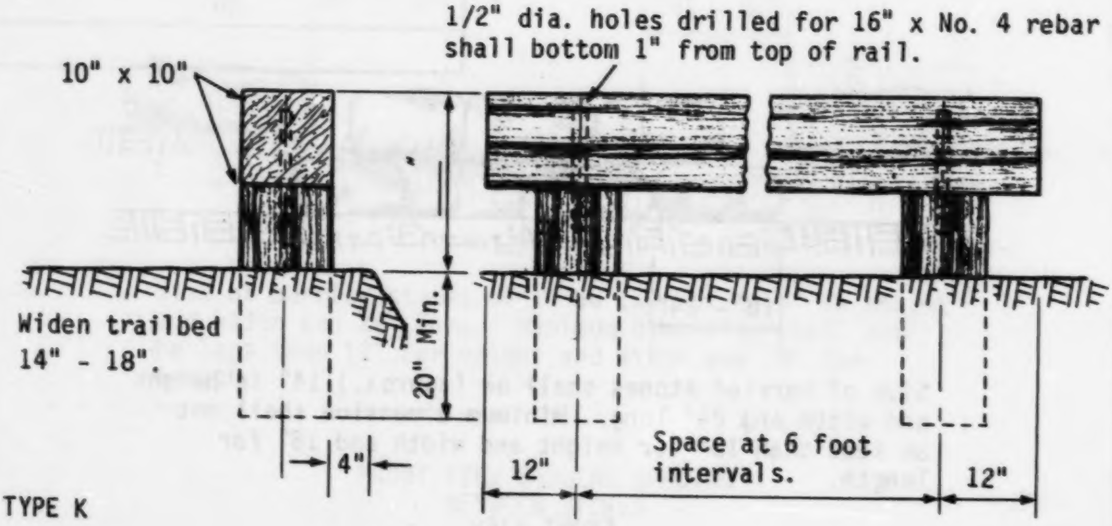
TYPE I
(Identical to Type J except single timber 10" x 10" laid on ground. Drilling details same as for top timber, Type J.)


Leave 3" - 4" opening between adjoining timbers.
3/4" dia. holes drilled for No. 6 rebar shall bottom 1" from top of barrier log.
10" x 10"
18" - 24"
Trailbed
Widen trailbed 14" - 18".
18" Min.
4"
12"
36"
36"
12"

TYPE J

Treated Timber

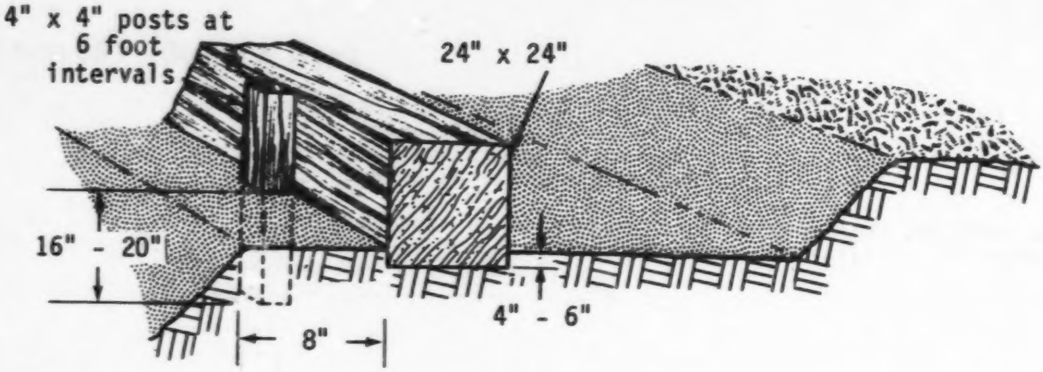
Type	Location	Species	Treatment Type	Min. Retention (Lb./C.F.)
	to			
	to			
	to			


1/2" dia. holes drilled for 16" x No. 4 rebar shall bottom 1" from top of rail.
10" x 10"
Widen trailbed 14" - 18".
20" Min.
4"
12"
Space at 6 foot intervals.
12"

TYPE K

953
.06

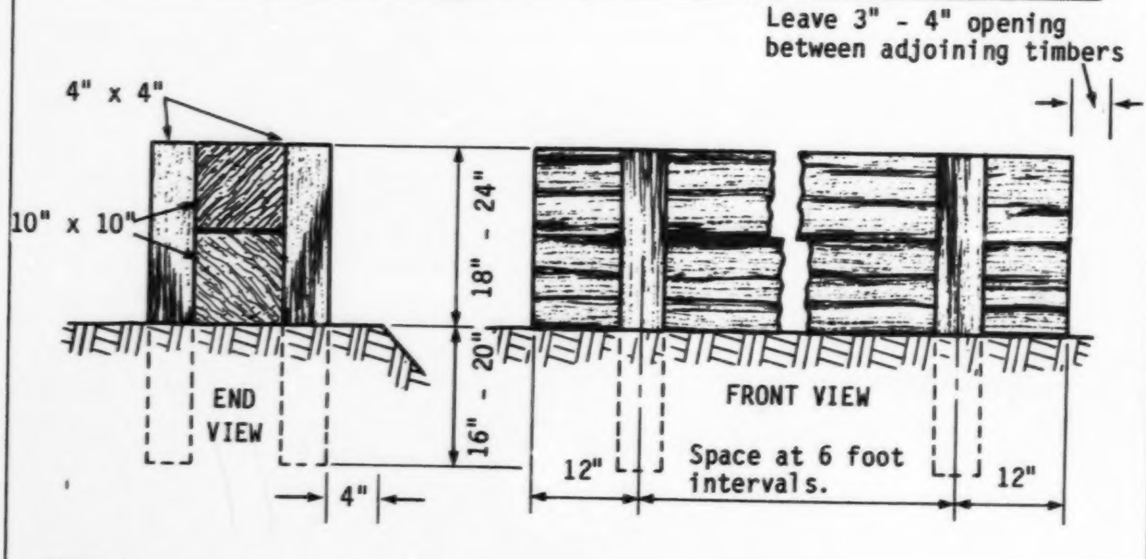
Treated Timber Barriers



TYPE L
Widen Trailbed 36".

Treated Timber

Type	Location	Species	Treatment Type	Min. Retention (Lb./C.F.)
	to			
	to			
	to			


Leave 3" - 4" opening between adjoining timbers
4" x 4"
10" x 10"
18" - 24"
16" - 20"
END VIEW
4"
FRONT VIEW
Space at 6 foot intervals.
12"
12"

TYPE M
Widen trailbed 24".

[illegible]

[illegible]

[illegible]

SECTION 960 MATERIALS

Section 961 - Stone & Rock

961.01
Stone & Rock

Stone and rock material shall be sound and durable and free of rifts, seams, laminations, and minerals that, by weathering, would cause deterioration. Stone and rock shall be dressed to remove thin or weak portions before use.

961.02
Sizes & Shapes

Stone and rock shall be furnished in the sizes and face areas necessary to produce the general characteristics and appearance SHOWN ON THE DRAWINGS.

Section 962 - Material for Timber Structures

962.01
Native Timber

Unless shown otherwise, native timber will be furnished by the Government. The species and sizes of materials to be used will be AS SHOWN ON THE DRAWINGS. All materials shall be reasonably straight, sound, and free of defects. Native trees or down logs selected by the contractor shall be approved by the Engineer in writing before being felled or moved to the site. Trees shall be felled to prevent damage to standing timber and to minimize breakage of trees to be utilized. Logs shall be bucked from felled trees in such a way to minimize waste and to obtain the required length and diameter.

Unless SHOWN ON THE DRAWINGS or IN SPECIAL PROJECT SPECIFICATIONS, native materials shall be peeled and trimmed square at the ends. All protruding knots and limbs shall be removed. Debris from the processing of native material shall be scattered along with clearing and grubbing debris.

962.02
Structural Timber & Lumber

Structural timber and lumber shall meet the requirements of AASHTO M 168.

Lumber shall be of the species and grades SHOWN ON THE DRAWINGS. Round poles and posts shall be of the kinds SHOWN ON THE DRAWINGS.

962.03
Hardware

Drift pins and dowels shall meet the requirements of ASTM A 307. All galvanized hardware shall meet requirements of AASHTO M 232.

Nails shall be cut or round nails of standard form. Spikes shall be cut, round, or boat, as SHOWN ON THE DRAWINGS.

962.04
Preservative Treatments

Wood preservatives and treatment methods shall meet the requirements of AASHTO M 133. The type of treatment to be used and minimum net retention of preservative will be SHOWN ON THE DRAWINGS. All treated timber shall be completely and accurately fabricated before treatment. All timber shall be clean and free of dripping oil.

Excluding pine, all surfaces greater than 2 inches in width and all Douglas fir and western larch surfaces shall be incised before treatment. Any area hewn, notched, cut, or drilled after the initial preservative treatment, shall be treated with two brush applications of preservative.

Retentions of preservatives in all lumber and timbers shall be determined by the assay method.

Section 963 - Drainage Pipe

963.01
Corrugated Iron or Steel Pipe & Pipe Arches

(a) Riveted Pipe and Pipe Arches. These pipes shall meet the requirements of AASHTO M 36.

(b) Welded Pipe and Pipe Arches. Corrugated metal pipe and pipe arches fabricated by resistance spot welding shall meet the applicable requirements of AASHTO M 36.

(c) Helical Pipe. Unperforated helically corrugated pipe with continuous lock or welded seams shall meet the applicable requirements of AASHTO M 36.

(d) Coupling Bands. Coupling bands shall meet the requirements of AASHTO M 36.

(e) Special Sections. Special sections, such as elbows, tees, and wyes, shall be the same thickness as the conduit to which they are joined and meet the applicable requirements of AASHTO M 36.

(f) Flared-End Sections. Flared-end sections for inlet and outlet ends of pipe and pipe arch culverts shall meet the applicable requirements of AASHTO M 36. End sections shall be fabricated in accordance with the details and dimensions SHOWN ON THE DRAWINGS, except minor variations may be accepted to permit use of the manufacturer's standard methods of fabrication.

963.02
Bituminous Coated Corrugated Iron or Steel Pipe & Pipe Arches

These conduits and their coupling bands shall meet the requirements of AASHTO M 190. The coating shall be Type A, B, C, or D, as SHOWN ON THE DRAWINGS. Coupling bands shall be fully coated with bituminous material.

Special sections, such as elbows and prefabricated flared-end sections, shall meet the applicable requirements of AASHTO M 190. Coating and invert paving shall be of the type specified. Flared-end sections shall meet the requirements of AASHTO M 243 or M 190 for the coating specified. The Engineer may waive the imperviousness test for coated pipe if no separation of coating from metal is observed.

When asbestos-bonded bituminous coating is specified, the above requirements shall apply; in addition, the special process of embedding asbestos fiber in the molten metallic bonding medium shall be used to bond the bituminous coating. Corrugated metal pipe shall be fabricated in accordance with AASHTO M 36 using asbestos-bonded sheets of base metal specified therein. Both sides of the metal sheets shall be coated with a layer of asbestos fibers pressed into the molten zinc bonding medium. Immediately after the metallic bond has solidified, the asbestos fibers shall be thoroughly impregnated with a bituminous saturant. The finished sheets shall be uniformly coated and free from blisters. After fabrication, the culvert sections shall be treated as specified for Type A, B, or C in accordance with AASHTO M 190. Coupling bands shall meet the requirements of AASHTO M 36.

963.03
Corrugated Iron or Steel Pipe for Underdrains, Plain Galvanized or Precoated

Plain galvanized pipe shall meet the requirements of AASHTO M 36. Precoated underdrains shall meet the requirements of AASHTO M 245.

963.04
Bituminous Coated Iron or Steel Pipe for Underdrains

Pipe shall meet the requirements of AASHTO M 36 and shall be coated with bituminous material to meet the requirements of AASHTO M 190, Type A coating, except that minimum coating thickness shall be 0.03 inch. Coupling bands shall be fully coated. The specified minimum diameter of perforations shall apply after coating. The Engineer may waive the imperviousness test if no separation of coating from metal is observed.

963.05 Corrugated Aluminum Alloy Culvert Pipe & Pipe Arches	Pipe shall meet the requirements of AASHTO M 196.
963.06 Corrugated Aluminum Alloy Pipe for Underdrains	Pipe shall meet the requirements of AASHTO M 196.
963.07 Bituminous Coated Corrugated Aluminum Alloy Culvert Pipe & Pipe Arches	Pipe shall meet the requirements of AASHTO M 196 and shall be coated with bituminous material meeting the requirements of AASHTO M 190. Coating and invert paving shall be of the type specified.
963.08 Bituminous Coated Corrugated Aluminum Alloy Pipe Underdrains	Pipe shall meet the requirements of AASHTO M 196 and shall be coated with bituminous material meeting the requirements of AASHTO M 190.
963.09 Aluminum Coated (Aluminized Type 2) Corrugated Steel Pipe & Pipe Arches	(a) Pipe and coupling bands shall meet the requirements of AASHTO M 36 except that they shall be made from material meeting the requirements of AASHTO M 274. (b) Special sections, such as elbows, tees, and wyes, shall be the same thickness as the conduit to which they are joined and shall meet the applicable requirements of AASHTO M 36 and M 274.
963.10 Polyvinylchloride (PVC) Sewer & Drain Pipe	PVC sewer and drain pipe shall meet the requirements of ASTM D 3034.
963.11 Corrugated Polyethylene (PE) Pipe	Corrugated PE pipe for culverts 12 inches through 24 inches in diameter shall meet the requirements of AASHTO M 294.

Section 964 - Geotextiles

964.01
Fabric

Nonwoven or woven fabric, as SHOWN ON THE SCHEDULE OF ITEMS, shall be constructed of synthetic polymers. The polymers shall contain at least 85 percent by weight of propylene, polypropylene, ethylene, vinylidene chloride, nylon, polyester, or combinations of these.

964.02
Woven Fabric

Woven fabrics shall contain stabilizers and/or inhibitors added to base fibers to make the cloth resistant to deterioration resulting from ultraviolet or heat exposure.

(a) Properties:

Open Area Range	4 to 10 percent
Thickness	15 mil (min.)

(b) Strength:

Abrasion Resistance (ASTM D 1175 & D 1682)	55 lb
Puncture Strength (ASTM D 751)	40 lb
Burst Strength (ASTM D 751)	210 lb
Grab Strength (ASTM D 1682)	130 lb

964.03
Nonwoven Fabric

Fabric weight shall be as SHOWN ON THE DRAWINGS or as specified below.

(a) Properties:

EOS Range	70 to 120 sieve
Fabric Weight	4.0 oz/yd^2 (min.)

(b) Strength:

Grab Strength (ASTM D 1682)	100 length/80 width (min.)
Grab Elongation (ASTM D 1682)	20 percent (min.)
Trapezoid Tear (ASTM D 1117)	40 lb (min.)

964.04
Certification

The contractor shall furnish a certificate or affidavit signed by an official from the company manufacturing the fabric, verifying that the fabric meets specifications.

964.05
Delivery, Storage, & Handling

During shipment and storage, filter cloth shall be wrapped in burlap or similar heavy duty protective covering. The storage area shall be such that the cloth is protected from mud, soil, dust, and debris. Filter cloth materials that are not to be installed immediately shall not be stored in the direct sunlight.

900 GENERAL SPECIFICATIONS

910 EARTHWORK

920 DRAINAGE

930 STRUCTURES

940 SURFACING

950 INCIDENTAL CONSTRUCTION

960 MATERIALS

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WO Al Colley

900 GENERAL SPECIFICATIONS

910 EARTHWORK

920 DRAINAGE

930 STRUCTURES

940 SURFACING

950 INCIDENTAL CONSTRUCTION

960 MATERIALS

ENGINEERING
TECHNICAL
INFORMATION
SYSTEM

EM-7720-102
June 1984

Standard Specifications for
Construction of Trails